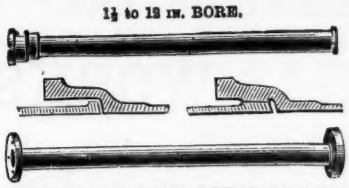
THE JOURNAL OF GAS LIGHTING
WATER SUPPLY & SANITARY IMPROVEMENT

VOL. LXII. No. 1578.] LONDON, AUGUST 8, 1893. [45TH YEAR. PRICE 6d.

GAS AND WATER PIPES

1¼ to 12 IN. BORE.



THOMAS ALLAN & SONS,

Bon Lea Foundry,

SOUTH STOCKTON-ON-TEES.

ALSO MANUFACTURERS OF
SANITARY & RAIN-WATER PIPES, HOT WATER PIPES, STABLE FITTINGS, RANGES, STOVES, And GENERAL CASTINGS.

GLASGOW OFFICE: 24, GEORGE SQUARE.
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— ESTABLISHED 1830. —

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Manufacturers & Contractors.

THE ONLY MAKERS OF

PATENT ANTIMONY PAINT,

Parker's Imperial Black Varnish,

Oxide Paints, Oils, and General Stores for Gas and Water Works.

WORKS:
ORMSIDE STREET, OLD KENT ROAD,
LONDON.

WOLSTON'S

TORBAY PAINTS

Special Quotations to Gas Companies.

DARTMOUTH, DEVON.

Lanemark Coal Co.,

LIMITED.

LANEMARK CANNEL

AND GAS COALS.

Quotations and Analysis on application to

LANEMARK COLLIERY,

NEW CUMNOCK, N.B.

Shipping Ports: All the principal Scotch Ports.

THE "C" BURNER.

NEW HIGH-POWER GAS-LIGHT.

INCANDESCENT GAS-LIGHT SYSTEM.

—o—

Consumes

4 cubic feet per hour.

Gives a light of

70 to 80 candle power.

Brilliant Light.

—o—

Perfectly Steady and

Noiseless.

Smokeless.

Reduced Heat.

Can be attached to any Gas-Fittings.

THE TRIUMPH OF GAS OVER ELECTRIC LIGHT.

Taking Gas at 3s. per 1000 cubic feet and Electric Light at 8d. per Board of Trade unit, the "C" Burner will produce an equal amount of light at **One-eighth the cost of Electric Light.** This cannot be disproved.

Prices and particulars on application to

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14, PALMER STREET, WESTMINSTER, LONDON.

Near St. James's Park Station.

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LATE

FLETCHER AND MURPHY,

GARRATT STREET WORKS, OLDHAM ROAD, MANCHESTER,

Manufacturers of

IMPROVED CONSUMERS' WET GAS-METERS

IN CAST-IRON CASES,

THE UNVARYING WATER-LINE GAS-METER,

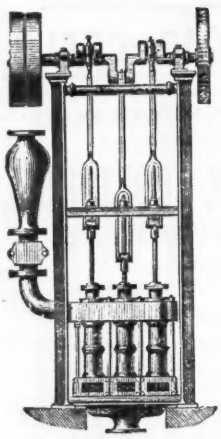
AND

IMPROVED DRY GAS-METERS.

SPECIALITY: PATENT CASH PREPAYMENT METERS.

STEAM & HAND PUMPS FOR GAS-WORKS,

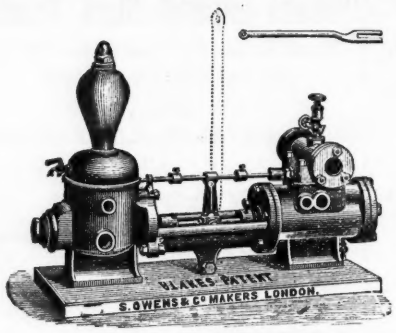
FOR PUMPING TAR, WATER, AND LIQUOR.



Treble-Barrel Pumps in Frame.

Syphon Pump.

Double-Barrel Force-Pump in Frame.



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PATENT
STEAM PUMPS.
20,000 IN USE.

Improved Double Action Pump.

Cast-Iron Hand-Pump.

Wrought-Iron Portable Pump.

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SOLE MANUFACTURERS OF

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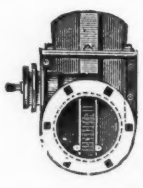
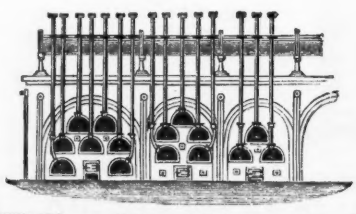
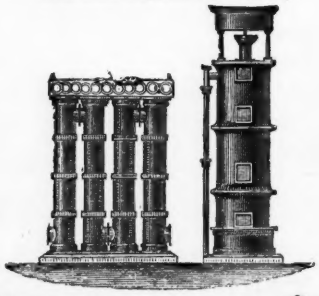
WITH RACK & PINION
OR
Internal or External
SCREWS, of all Sizes.
GASHOLDERS,
AND
Gasholder Tanks.



CAST-IRON RETORTS,
RETORT-BED FITTINGS,
And Retort-House Appliances
of every description,
Iron Roofs, Columns, Girders, Floor Plates and Tools, &c.



WROUGHT AND CAST IRON
CONDENSERS,
SCRUBBERS, & WASHERS,
TAR AND LIQUOR PUMPS, &c,



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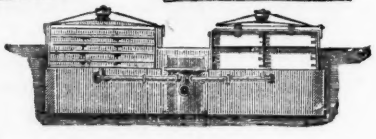
for working Purifiers.
Also Bye-Pass & Stop Valves

PURIFIERS with Planed Joints,
HAND and HYDRAULIC LIFTING GEAR, CAST-IRON MAINS and SPECIALS,
WOOD GRIDS.
CAST AND WROUGHT IRON TANKS AND CISTERNS.



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Pig Iron (*Special Quality*) for ENGINE CYLINDERS, &c.

GAS COAL FAMOUS FOR ITS UNRIVALLED EXCELLENCE.

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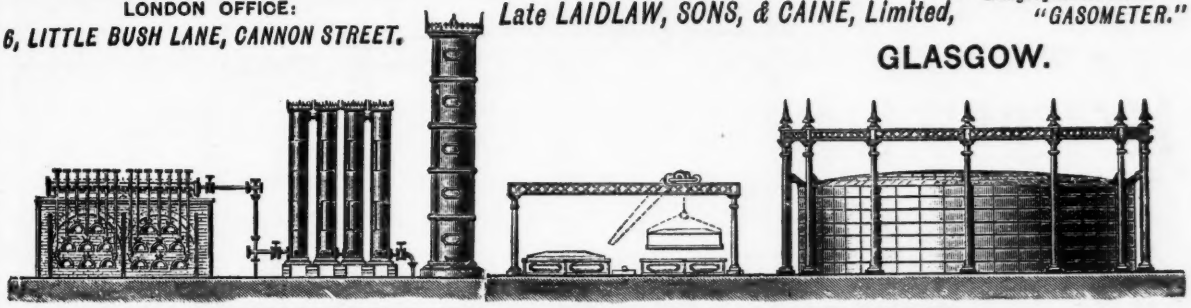
GLASGOW.



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RETORT-BENCH FITTINGS; SIEMENS'S REGENERATIVE AND ORDINARY FURNACES;
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PURIFIERS, WITH PLANED AND CEMENT JOINTS;
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HENDERSON'S Patent Retorts, Condensers, Stills, Cast and Wrought Iron Tanks, Ammonia Stills, Wrought-Iron Gas-Mains, &c., &c.

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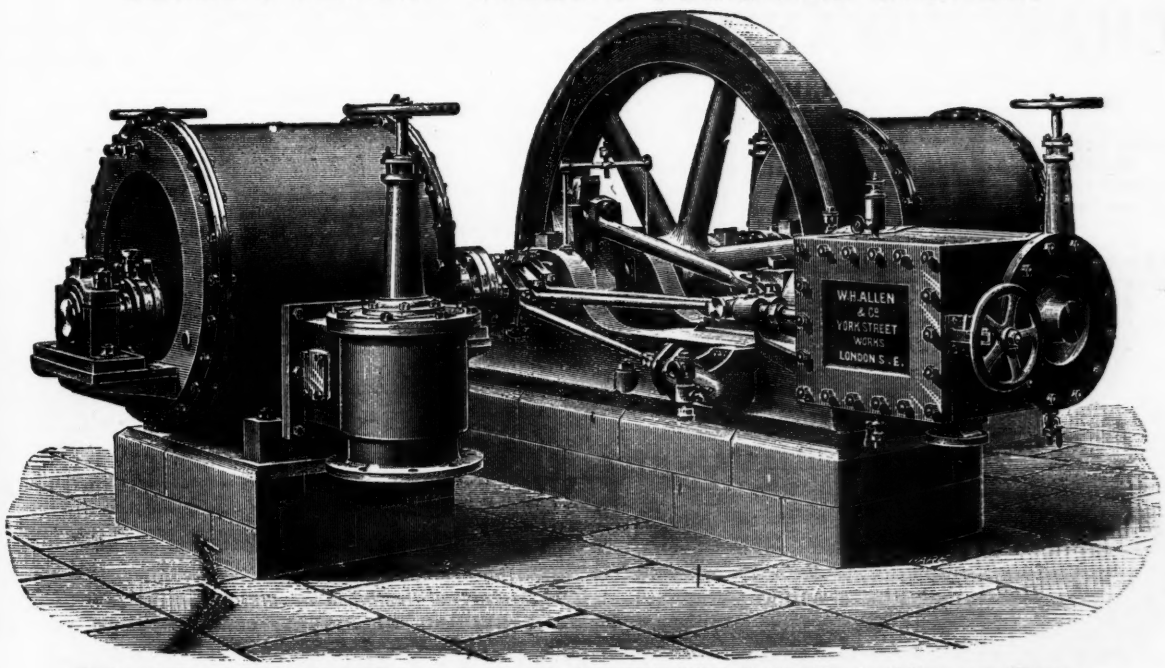
MAKERS OF THE MOST IMPROVED FORM OF

GAS EXHAUSTING MACHINERY.

BEALE'S PATENT—ALLEN'S COMBINED SYSTEM.



Pair of Non-Oscillating Exhausters, passing 200,000 Cubic Feet of Gas per Hour.

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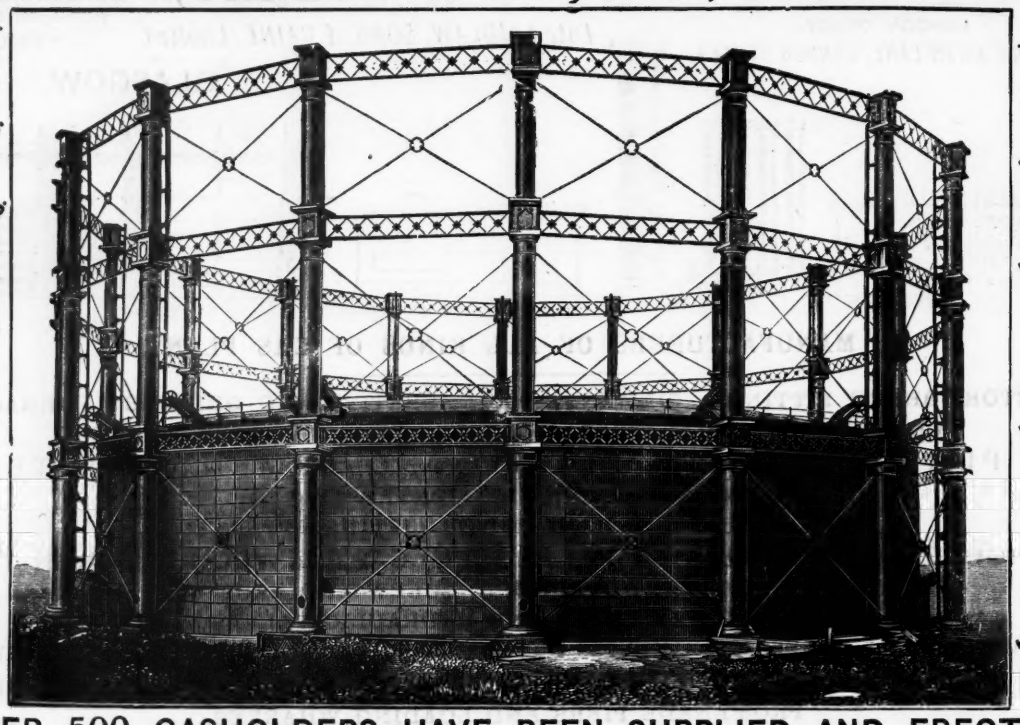

TELEGRAPHIC ADDRESS: ATLAS, BIRMINGHAM.

WELDED & RIVETED PIPES, MAINS, RETORT LIDS, WROT & CAST TANKS, PURIFIERS.

OVER 500 GASHOLDERS HAVE BEEN SUPPLIED AND ERECTED,

INCLUDING THOSE SUPPLIED TO THE FOLLOWING GAS COMPANIES AND CORPORATIONS:

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BECKTON.	BRADFORD.	CARDIFF.	LEEDS.	NOTTINGHAM.	RIO GRANDE.	SYDNEY.
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WEST'S GAS IMPROVEMENT Co., Ltd.,

Engineers, Ironfounders, & Contractors,

ALBION IRON-WORKS, MILES PLATTING, MANCHESTER,

MANUFACTURERS OF

WEST'S PATENTED MACHINERY

FOR

CHARGING AND DRAWING GAS-RETORTS.

OVER **240** MACHINES AT WORK AND IN COURSE OF CONSTRUCTION.

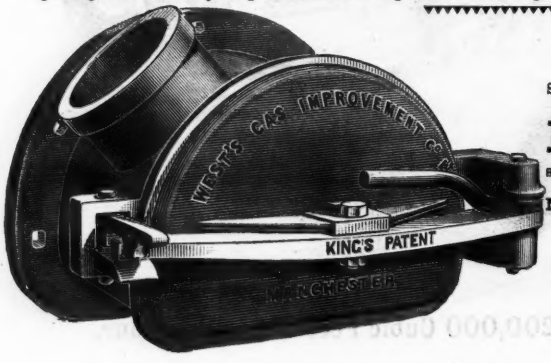
Advantages attending its use are:—

INCREASED VOLUME of GAS per TON, and INCREASED YIELD per Retort.—The system of breaking and distributing the coals in an even layer in the retorts effecting more perfect carbonization.

REDUCTION in LABOUR and COST of WORKING.—In Works where this System of charging and drawing Retorts is adopted, there has been effected a substantial saving in the cost of Gas Manufacture in the Retort-House; the amount saved varying in different Gas-Works from **8 PENCE** to **15 PENCE per Ton** of coal carbonized. Full particulars will be forwarded upon application to W. G. I. Company, Limited.

MANUAL CHARGING AND DRAWING MACHINES.

POWER CHARGING AND DRAWING MACHINES, driven by COMPRESSED AIR, STEAM, or ROPE. The power machines are applicable to circular, oval, or Ω-shaped retorts and mouthpieces, and are the most perfect, economical, efficient, and durable machines made. They are constructed on principles founded by long and extensive experience in this special branch of gas engineering and the manufacture of gas.



MAKERS OF COAL BREAKING, ELEVATING, AND CONVEYING MACHINERY, COKE BREAKING AND WASHING MACHINERY.

Sole Makers of CIRCULAR, OVAL, or Ω-shaped MOUTHPIECES with Morton's Self-Sealing Lids, fitted with

KING'S PATENT FASTENINGS,

secure a very tight joint; and at the same time the eccentric motion given to the Lid effectually removes the Tar from the surfaces of the Joint.

N.B.—The whole of these Fittings are made of Wrought Iron. Several Thousands in use.

West's Improved Combined Regulating Liquor Seal Valve.

OXIDE ELEVATING MACHINERY, COKE BARROWS, VALVES, AND ALL GAS-WORKS PLANT, &c.

Illustrated Catalogue sent upon application.

Mr. JOHN WEST, M.Inst.C.E., *Managing Director.*

GAS COAL.

BEST
REAL OLD SILKSTONE GAS COAL,
Address THE STRAFFORD COLLIERIES COMPANY,
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Wrought-Iron

And Fittings and Accessories.

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MANUFACTURERS OF
WROUGHT-IRON TUBES & FITTINGS for GAS, WATER, & STEAM,
BRASS GAS-FITTINGS, GAS-VALVES, STEAM & WATER VALVES, TOOLS, &c., AND OF
WARNER'S PATENT MARKET GAS STAND-PIPE.
LONDON: LAMBETH BRASS & IRON CO., Short Street, LAMBETH.

JOHN BROWN & CO., LTD., SHEFFIELD,
Proprietors of
ALDWARKE MAIN CAR HOUSE & ROTHERHAM MAIN COLLIERIES, NEAR ROTHERHAM.
ALDWARKE MAIN GAS COAL
Analysis: 12,600 feet of 19-candle gas per ton.
Weight of illuminating power in pounds of sperm, 820·80. Very free from impurities.
Telegrams: "ATLAS SHEFFIELD."

INCLINED RETORTS,
FIRE BRICKS,
LUMPS, TILES,
BLOCKS, &c.
Special Bricks for Intense Heats.

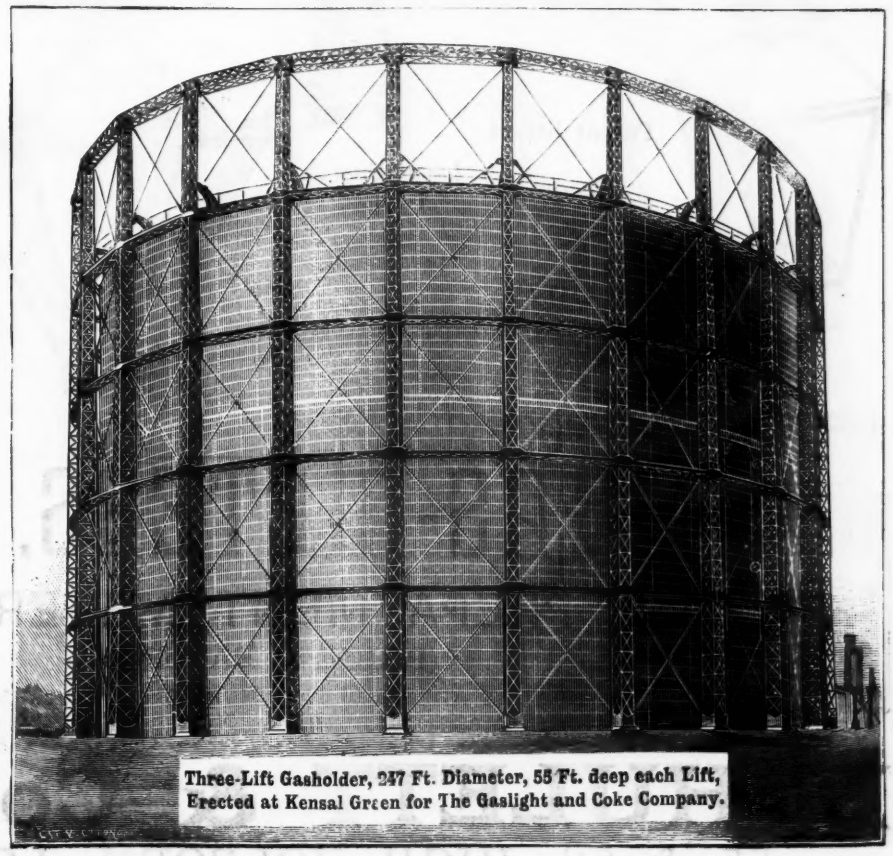
GAS RETORTS.

CASTINGS AND
EVERY REQUISITE
FOR
GAS-WORKS.

MOBBERLEY & PERRY,
Fire-Brick Works, STOURBRIDGE.
☞ Retort Setters sent to any part of the Kingdom.

SAML. CUTLER & SONS, MILLWALL, LONDON.

NEARLY
8 MILLION
CUBIC FEET
CAPACITY.


Three-Lift Gasholder, 247 Ft. Diameter, 55 Ft. deep each Lift,
Erected at Kensal Green for The Gaslight and Coke Company.

Gas Lamps and Posts.

Patent Street Lamps.

NO PUTTY.

Several thousands of these are now in use, giving general satisfaction. They are strongly made, and of best material.

Lamplighters' Torches.

Lever Taps.

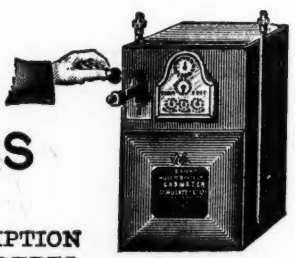
Lamp Governors.

PRICE LIST ON APPLICATION.

SPECIAL HIGH-POWER LAMPS.

For Lighting Streets, Refuges, Promenades, &c., where a good light is required. Fitted with Porcelain cone, Copper top and perforation, Wrought-Iron Spray, Lever Tap, Burner and Patent Governor, glazed with Opal top.

GAS-METERS.



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(PRICE'S PATENT)

SPECIALLY ADAPTED FOR INCREASING CONSUMPTION AMONG SMALL CONSUMERS. NO RISK OF BAD DEBTS.

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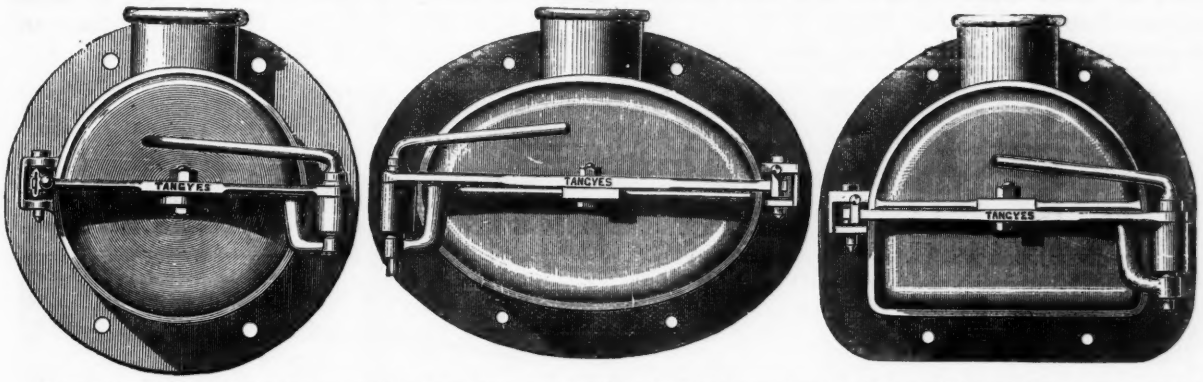
55 & 56, HIGH HOLBORN, LONDON.

TANGYES LIMITED, CORNWALL WORKS, BIRMINGHAM.

AND AT LONDON, NEWCASTLE, MANCHESTER, GLASGOW, SYDNEY, MELBOURNE, JOHANNESBURG, GENOA, BILBAO, & ROTTERDAM.

MORTON'S SELF-SEALING RETORT-LID,

With Holman's Anti-Friction Catch, Self-Sustaining Cross-Bar, and Improved Eccentric Bolt.



These Retort Lids and Fastenings are made in three forms, round, oval, and ⌂ (as shown above), in each of which we have a very extensive variety of patterns, from which Gas Engineers contemplating the adoption of these Lids are recommended to make their selection, in order to avoid cost of pattern-making, delays, &c., &c.

QUOTATIONS WILL BE GIVEN ON RECEIPT OF PARTICULARS OF REQUIREMENTS.

LIST OF PATTERNS ON APPLICATION.

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GASHOLDERS

A Four-Lift Gasholder, nearly 200 feet high and 8 million cubic feet capacity, has been recently erected by us for The Gaslight and Coke Company, London.

PURIFYING MACHINES.

PURIFIERS. SULPHATE PLANT.

Weck's Centre-Valve.

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MIDLAND IRON-WORKS, DONNINGTON, NEAR NEWPORT, SHROPSHIRE;

10, Finsbury Square, London.

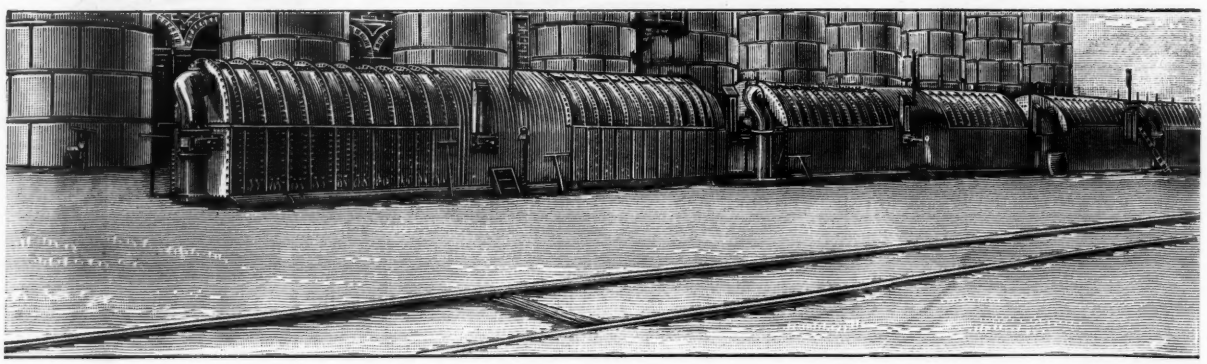
"FORTRESS DONNINGTON." "FORTRESS LONDON."—Telegraphic.

KIRKHAM, HULETT, & CHANDLER, LD.,

Patentees of the

PATENT "STANDARD" WASHER-SCRUBBER.

☞ **465 of these Machines (capable of dealing with 440,807,000 cubic feet of Gas daily) have been supplied, which fact is given as evidence of this apparatus being the Most Efficient of any in the Market for the extraction of Ammonia, Carbonic Acid, and Sulphuretted Hydrogen from Coal Gas.**



View of SIX PATENT "STANDARD" WASHER-SCRUBBERS, erected at the Beckton Station of The Gaslight and Coke Company (the Engines driving same being under Galvanized Iron Covers). This Company has **27** of these Machines in use; and they are also in operation at a great number of Gas and other Works in this Country and abroad.

Address : 3 & 4, Palace Chambers, Bridge St., Westminster, S.W.

THE WIGAN COAL & IRON CO., LIMTD.,

Are exclusive Owners of the well-known HAIGH HALL & KIRKLESS HALL GAS COAL COLLIERIES, and supply the Best Wigan Arley Mine Gas Coal, Gas Nuts, Gas Cannel, Cannel Nuts, &c.

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CHEAPEST! MOST ORNAMENTAL AND RELIABLE!

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THE WENHAM COMPANY, LTD. UPPER OGLE STREET, **LONDON, W.**

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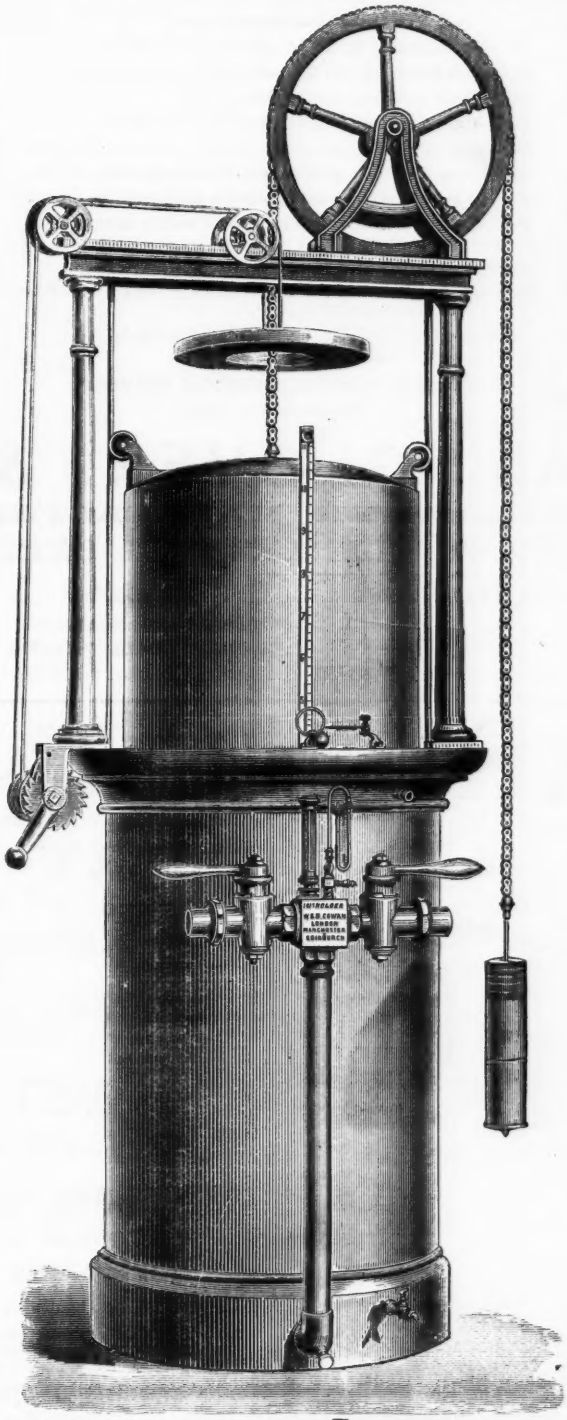
GOVERNMENT STANDARD

TESTING GASHOLDERS.

The Cycloid is dispensed with, as being both troublesome and unnecessarily complicated, and far less reliable in action than the compensating counter-balance chain, with which these Testing Gasholders are fitted.



Prices and Particulars of the various Sizes furnished on application.

W. & B. COWAN,

ESTABLISHED 1827

SMITH SQUARE WORKS, WESTMINSTER, LONDON, S.W. TELEPHONE No. 3250.

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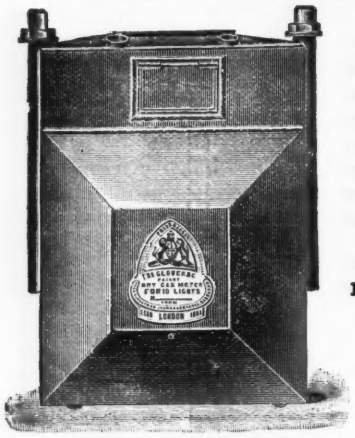
[ESTABLISHED 1844.] **ORIGINAL MAKERS.** [ESTABLISHED 1844.]

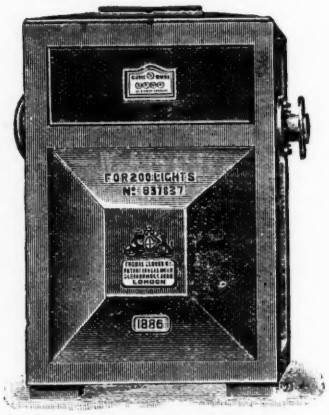
LONDON, 1851. NEW YORK, 1853. PARIS, 1855. LONDON, 1862. DUBLIN, 1865. PARIS, 1867.

THE SIX MEDALS AWARDED TO THOMAS GLOVER'S PATENT DRY GAS-METERS;
The latter being the Highest Award for Dry Gas-Meters at the Paris Exhibition, 1867. Since then we have not Exhibited FOR PRIZES.



1st.—Are a remedy for all the defects of Wet Meters.
2nd.—Are suitable for all Climates, whether hot or cold.
3rd.—Incur no loss of Gas by Evaporation.
4th.—Cannot become fixed by Frost, however severe.
5th.—Are the most accurate and unvarying measurers of Gas.
6th.—Prevent jumping or unexpected extinction of the Lights.
7th.—May be fixed either above or below the level of the Lights.
8th.—Cannot be tampered with without visibly damaging the outer case.
9th.—Will last much longer than Wet Meters.
10th.—Will not cost more than one-half for repair that Wet or Water Meters do.

Are upheld for five years without charge.



Telegraphic Address: "GOTHIC LONDON."
Telephone No. 6725.

THOMAS GLOVER & CO.,

DRY GAS-METER MANUFACTURERS,

214 to 222, ST. JOHN ST., CLERKENWELL GREEN, LONDON, E.C.

BRISTOL: 62, VICTORIA STREET. *Telegraphic Address: "GOTHIC."*

BIRMINGHAM: 3, BRIDGE ROW, DERITEND. *Telegraphic Address: "GOTHIC."*

LEEDS: BOAR LANE CHAMBERS, 4, BASINGHALL STREET. *Telegraphic Address: "GOTHIC."*

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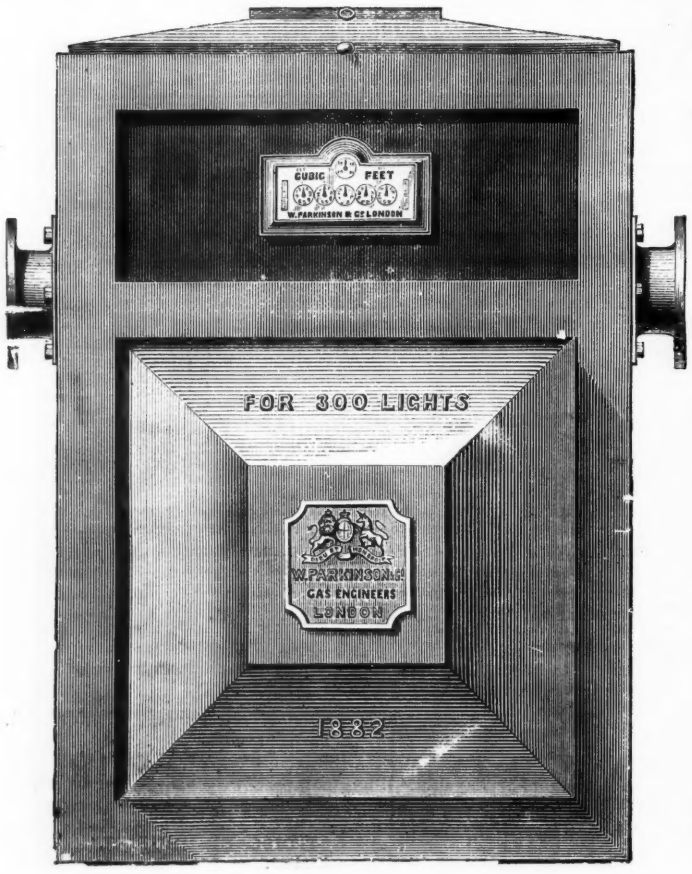

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TO CORRESPONDENTS.

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THE

JOURNAL OF GAS LIGHTING,

WATER SUPPLY, & SANITARY IMPROVEMENT.

TUESDAY, AUGUST 8, 1893.

The Chartered Meeting—Mr. J. O. Phillips's Retirement.

THE meeting of The Gaslight and Coke Company last Friday was somewhat sparsely attended; and the proceedings were not marked by anything like those "incidents" which have on previous occasions diversified the solemn dulness of the Horseferry Road forum. It is to be noticed, with regret, that the ex-Secretary and General Manager—Mr. John Orwell Phillips—was not well enough to appear in person to take leave of the corporate body of proprietors whom he has served so long and well. It is possible that, even had his health been equal to the strain of what would naturally have been a painful ordeal, Mr. Phillips might have been advised to stay away while the subject of his retiring allowance was discussed; but this would have been a piece of false delicacy. For, whatever criticisms Mr. Phillips has had to bear in the course of his active career, and whatever animosities certain developments of the policy of the Chartered Company may have created in some quarters, there can be no question either of the value of the services which the late Secretary and General Manager rendered to the undertaking that claimed his allegiance, or of the obligation upon the proprietors to recognize them in a substantial way. The former is matter of history. What Mr. Phillips did for the Chartered Company is writ large in the capital accounts of The Gaslight and Coke Company. Time was when any one of the several Gas Companies among whom the supply of the greater part of the Metropolis was apportioned might have taken the lead in that process of consolidation which has apparently reached its limit. But, as a matter of fact, it was the Chartered—that is to say, Mr. Phillips—that came to the front; and of the others the remaining memorial is certain stocks of The Gaslight and Coke Company, distinguished by an array of initial letters. Whatever strength these absorbed undertakings possessed, went to the support of the Chartered. This was Mr. Phillips's glory; and, if on this account alone, he richly deserved all that was said and done for him on Friday.

Upon the delicate question of the management of the undertaking, apart from the constitutional triumphs of the policy of amalgamation, we wish to touch but lightly. It is impossible to pass over the subject altogether, because the Directors have elected to perpetuate, by their choice of their unquestionably able Chief Accountant to fill the offices rendered vacant by Mr. Phillips's retirement, the system of indoor or counting-house administration which has hitherto been the distinguishing characteristic of the Horseferry Road concern. We have argued time and again, and we hold the same opinion yet, that the system has not been justified by results. All our admiration for Mr. Phillips as the director and controller of the policy that made The Gaslight and Coke Company the big thing it is, does not blind us to the fact that this big thing has not done so well for the public as was expected of it, and is not so remarkable for the quality as it is for the range of its operations. Mr. Phillips effected large economies in working, and swept away many abuses that had sprung up under the old *régime* of maximum dividends, when some high and mighty gas-works officials comported themselves like Olympian gods, with none to make them afraid. He did his best to place gas supply upon the strict commercial basis; and he was fond of saying that he regarded himself as a tradesman, a shopkeeper. It galled him to think of gas supply as being a protected monopoly; and he liked to regard the consumer as a customer. For all this, however, he was essentially a man of the council chamber, and neither of the factory nor of the market. He was not great at figures, and was devoid of the engineer's aptitude for isolating and dealing with concrete materialities. A wonderful man, born to high control; but with his limitations, like other mortals, and to these limitations on his part, and the lack of anybody near him to supply that in which he failed, must be ascribed the inferior position of the huge Gaslight and Coke Company to its neighbours in the matters of capital burden and the selling price of gas.

These facts cannot be disputed, although our interpretation of their cause may be traversed. Meanwhile, we shall continue to hold it, in default of a better. Apart from all personal considerations whatsoever, we believe it is demonstrable by reference to the past and contemporary history of the gas industry, that the head of a gas undertaking had better be a man whose training has been in action than one who has only had to deal with books and papers. The Directors of The Gaslight and Coke Company have seen otherwise; and we do not presume to deny their right to act upon their own judgment, still less to cavil with the way in which, with such a policy to guide their choice, they have filled Mr. Phillips's vacant

chair. Surely this is a point of principle upon which men of sense may agree to differ without mutual recrimination, while they watch events.

The South Metropolitan Report and Accounts.

THE report of the Directors of the South Metropolitan Gas Company will be found in another column; and the statement of accounts relating to the past half-year's working will appear in our next issue. The first paragraph of the report conveys the satisfactory information that, notwithstanding the reduction in the price of gas to 2s. 5d. per 1000 cubic feet as from Lady Day, the revenue has proved sufficient to pay the dividend, and all charges for interest, with a surplus of £1246, which will swell the undivided balance to £6469. The consumers are reminded that the penny reduction means £28,000 a year to them; and it may also be pointed out that the narrowness of the profit margin shows how closely the Company cut their selling prices. The consumption of gas in the district only just holds its own—the increase being fractional as compared with that for the corresponding half of last year. But this is very good, considering the character of the season; and it is explained in another part of the report, which records a phenomenal addition to the number of consumers, due to the introduction of the automatic prepayment meter system. It is a coincidence that the present number of the JOURNAL should be so full of references, from independent sources, to this system. The South Metropolitan Directors speak of it with an enthusiasm which may or may not be alloyed by longer experience. By the way, what a picture of South London is conveyed by the words of the report which mention the "very many miles of streets of workmen's "houses in which the Company's mains supply only public "lamps, with here and there a shop—the working-class "inhabitants, as a rule, not being able to bear the cost of "fitting up their houses, nor to pay for a supply of gas "quarterly." Who that has ever wandered through these featureless regions will fail to admit the accuracy of the description? It is a very remarkable fact that one out of every four of the whole number of the Company's consumers now hires a gas cooking-stove of one kind or another. Some reference in the report to the profit-sharing scheme is inevitable. It is claimed, after four years' working of the system as applied to officers and workmen without distinction, that the results are excellent. The Committee of Directors, Officers, and Workmen is declared to be a "power for good" in the works; and the confidence of the men in their employers is shown by a considerable number of them having invested a large amount in the ordinary stock, while the Company hold in addition £30,000 of the men's money at 4 per cent. interest. The same rate of dividend as before is to be recommended.

The accounts show a considerable increase of capital expenditure upon meters. The revenue account exhibits a reduction of income under all the principal heads; the return from products having fallen off by £9367. On the other hand, the cost of coals has dropped from £231,908 to £196,949. Profit-sharing cost £8394 for the twelve months to June 30. Distribution has gone up slightly; and so have rates and taxes. Law charges are heavy, on account of the recent litigation. For the first time the expenses of the Board of Trade Photometric Standards Committee are brought into the Company's accounts, amounting altogether to £866. Forfeitures to the extent of £206 12s. also have to be deducted from the divisible profits; this being the largest amount we have yet noticed as lost in this way.

A Mistake in Municipal Politics.

THE London newspapers have noticed during the past week a programme of municipal reform for the Metropolis, issued by a new organization calling itself "The London "League," and confessedly framed to act as a counterblast, from the Conservative camp, to the notorious "London "Program" of the self-styled Progressive party. The gentlemen who have set themselves to this task are not a very remarkable or notable set of politicians, judged from the party standpoint; and it is doubtful if the heads of the Conservative cause will thank them for their crude attempt to beat the Progressives at their own game of promising the municipal electorate of the Metropolis all sorts of reforms and benefits in exchange for support at the County Council and Vestry polls. At the last elections, the so-called "Moderates" were badly beaten, mainly, as was asserted at the time, because they had no policy beyond that of resistance to the "forward" movement of the other side. Accordingly, while the middle-class burgess remained idly at home, as usual, the Moderate men had no chance with the lower-class voters against the hot-and-strong propagandism of men like Henderson and Tims. The new League is apparently intended to supply this want, and starts in business with any amount of policy for the supply of its favoured candidates, among which the regulation of gas supply finds a prominent place. Whereas the "Progressive" clamours for the municipal ownership of the gas-works of London, the new League "affirms the expediency of the supply of light by the "Gas Companies and the supply of water by the Water "Companies being subject to the supervision of the "Local Government Board, whose officials shall examine "into complaints of overcharge or inferior supply; the "Local Government Board having authority to initiate "proceedings for the enforcement of the Acts governing "such Companies, and for the protection of consumers." Many other ideas crowd the new programme, as to which, on the whole, we can only say that the attempt to steal the "Progressive" thunder will probably meet with its natural punishment. What ails the "Moderates" that they cannot leave their rivals alone? It will surely appear in time that the glaring promises of the Social Democratic party cannot possibly be carried out; and then the leaders will lose what little credit they may have among the more ignorant order of voters. Whenever any political reform lets a new stratum of the populace into the region where administrative power is manifested, there is always a cry for all sorts of fresh things to be done in the public interest. Every new political broom is going to sweep the world so very clean, that poverty and wretchedness shall no longer be found therein! The newly enfranchised shout for the charlatan who promises them most; and the wise man who, remembering his feebleness in comparison with the might of Ancient Evil, promises little, is left on one side by the eager multitude. There have always been "Progressives" and "Moderates" in politics, under one name or another, since popular government began to be. But what is the end of the conflict? Merely corroboration of the couplet which bids the thoughtful man notice

> "How small, of all that human hearts endure,
> That part which laws or kings can cause or cure!"

The number of those who appreciate this truth is ever increasing; but it is useless to rebel against the necessity that they shall be put in the background for the time by any political movement that brings a new set of sciolists to the front. Let the Progressive alone, and if he is an honest man he will ripen into a Moderate in due season.

The Miners' Strike.

MATTERS still remain *in statu quo* in the Federation coal districts, there being no present indication of a settlement of the dispute, despite the hasty jubilation of a few "popular" newspapers at the end of the week, which came out with head-lines announcing the triumph of the strikers. The strike has spread a little; but, on the other hand, there is no prospect of the Northumberland and Durham miners coming out in support of the Midland men. Consequently, the dispute will be fought out upon the original lines; and it will be seen in the end whether the contract prices of coal do regulate the rates of wages paid for winning it, or whether these can be maintained at a fancy figure by the Executive of the Federation. As we anticipated last week, the temporary and accidental rise of price due to the interruption of the Midland supply has redounded to the advantage of both owners and miners in some districts where work has not yet been suspended; and this circumstance has been made use of by the Federation leaders in support of their contention that coalowners everywhere could, if they wished, keep the prices of coal at a steady paying average. It is hardly necessary, however, to lay stress upon the obvious point that it is upon the big contract sales that coalowners have to reckon, and that "snap" profits secured for a week or two by taking advantage of the exigencies of the retail trade do not materially affect the issue. What makes the case of the Federation strikers more hopeless even than the firm front of the employers, is the apathy

shown by the general public. There is no such "scare" in the coal market on this occasion as marked the last Durham strike. The household demand for coal is at its yearly minimum; and the majority of people are simply delaying for a few weeks their customary orders for filling cellars in preparation for the winter. Meanwhile, rather than pay the enhanced price asked for by the retailers, prudent householders are keeping their kitcheners going with coke. It is an ill wind that blows nobody any good; and we hear on all sides that coke is going off very satisfactorily. Questions have been addressed publicly to the managers of the principal Gas Companies, who have been able to remove any suspicion that may have been entertained with regard to the sufficiency of their stocks of coal at this juncture; so that, on the whole, whatever may be the case with the strikers, the public in general appear to be quite prepared to do without Midland coal for an indefinite period. Trouble and suffering will be caused to the iron and other fuel-using industries of the strike region which cannot fall back upon "foreign" coal; but the threat of the Unionist coal porters to abstain from handling such imports where they are necessary, with a view to assisting the Federationists, is mere vapouring, which does not disturb anybody. We have seen enough of these sympathetic resolutions to be able to take them at their true value, which is *nil*.

Mr. F. Chalmers, of Alva, has been appointed Manager of the Stevenston Gas Company.

The Management of the Blackburn Gas-Works.—Mr. S. R. Ogden has been appointed Engineer and Manager of the Blackburn Corporation Gas-Works, in succession to his father.

Mr. Charles Lindsay, who has been for many years in the employment of the Perth Gas Commissioners, has been appointed Treasurer to that body, in succession to the late Mr. John M'Gillewie.

Gas Analysis over Petroleum.—Dr. A. Fajaus described in the *Chemiker Zeitung* recently an apparatus for the collection and analysis of gas over petroleum in place of water or mercury. It was primarily devised for the estimation of oxygen in the air occluded in eggs; but it may well be of use in other cases. The eggs were broken beneath an inverted funnel immersed in petroleum; and the gases evolved passed up into a burette, while the liquid contents sank to the bottom of the oil. Mercury did not, on account of its high specific gravity, allow of this easy separation of the gaseous and liquid contents of the eggs; and water dissolved a portion of the contained gases. Test analyses of air over petroleum and mercury gave concordant results. The oil used in the experiments was the ordinary Austrian burning petroleum.

Mr. Charles H. Parkes, who for many years filled the position of Official Auditor, under the Board of Trade, of the London Gas Companies' accounts, has resigned, on account of ill-health, the chairmanship of the Great Eastern Railway Company, which he held for a period of nineteen years out of the twenty-four during which he was a Director. At the meeting of the Company on Monday of last week, a resolution was unanimously passed voting him 2000 guineas; the Deputy-Chairman (Lord Claud Hamilton) remarking that this sum in no sense represented what they felt they owed to their Chairman, but was merely a small expression of their good feeling towards him; his administration having raised the position and credit of the Company until they now ranked among the first-rate railway companies of the kingdom.

Issue of Bonds of the Salt Lake and Ogden Gas and Electric Light Company.—In another part of the JOURNAL appears an announcement that the Gas, Water, and General Investment Trust, Limited, are offering for subscription $1,250,000 of 6 per cent. 25-year first mortgage gold bonds (part of a total issue of $1,500,000), at the price of £205 per $1000 bond. The bonds will be a first charge upon the property of the Salt Lake and Ogden Company, subject only to outstanding bond issues amounting to $110,000, to be provided for out of the present issue. The Company have acquired by purchase, and have consolidated, the three gas undertakings in Salt Lake City and Ogden, upon which Messrs. Stevenson and Burstal, MM.Inst.C.E., of Westminster, have reported favourably from an engineering standpoint; while Messrs. Kemp, Ford, and Co. have thoroughly investigated their financial condition. The sum actually expended upon the properties, the value of the land unused, and the cash reserved for future extensions, exceed the amount of the present issue of bonds by $109,374. As the Company hold privileges and franchises, having about twenty-five years to run, in each city, the growth of their business seems assured. The bondholders' trustees are the Farmers' Loan and Trust Company of New York; and with a view to securing continued efficient management of the properties, an English Company, the Board of which is composed of Directors of the above-named Trust, has been formed, in which the control of the American Company will be vested.

ESSAYS, COMMENTARIES, AND REVIEWS.

GAS AND WATER COMPANIES IN THE STOCK MARKET.

(For Stock and Share List, see p. 277.)

THE past week—the week before August Bank Holiday—ordinarily so quiescent, has been unusually animated. Although throughout it was considerably more calm than the turbulent period which preceded it, and although as it progressed to the close there were certain signs of a better tendency, yet the amelioration did not come at first, and the opening gave but little promise of amendment. However, after a brief period of uncertainty, Americans took a distinctly favourable turn, and prices recovered. Other markets were sympathetically affected; and a firm tone was observable in most, though business remained quiet. Special circumstances have influenced certain lines—*e.g.*, the Foreign Market by fighting in Argentina, and home rails by the coal strike and dividend announcements. The demand for gold for the United States has hardened the Money Market; and on Thursday the Bank of England rate was raised to 3 per cent.—having stood at 2½ per cent. since the 15th of June. The rise had little influence on the prices of securities, although it had not generally been discounted. The Gas Market has been fairly active, considering the season of the year. There is little variation in the quotations; but the few changes noted are in the upward direction; and, taken in conjunction with the course of prices recently, they point to the probability of Gas stocks increasing in value. In Gaslights, the "A" was moderately dealt in at an advance of 1 upon the previous week's quotation. Very little was done in the secured issues, which remained steady, and mostly unchanged. South Metropolitan were quite untouched (though "B" advanced in value), and Commercials very nearly so; a solitary transaction in the old stock being all the record. The Suburban and the Provincial Companies manifested no particular feature; and their prices did not vary. The Continental undertakings did not attract much attention, but shared in the general improvement—Union going up 1. None of the rest made any move. The Water Companies were very quiet, even for them, but steadily continued the rate of improvement in value which they have for some time past been effecting.

The daily operations were: Gas opened firm on Monday, but remained very quiet all day. Gaslight "A" advanced 1. There was a shade more activity on Tuesday, at unchanged prices, and quotations did not move. Business rather relapsed on Wednesday; but the firmness was unabated. Alliance and Dublin rose ¼. Both issues of Lambeth improved 1. Transactions on Thursday were in about the same volume; and Gas stocks remained unchanged, while East London Water gained 1. Dealings received quite a fillip on Friday; being considerably brisker, and quotations rose more freely. Continental Union improved 1; South Metropolitan "B," 1; and Gaslight 6 per cent. debenture, 2. East London and both Lambeths rose 1 each; and West Middlesex, 3.

ELECTRIC LIGHTING MEMORANDA.

Colonel Makins on Electric Lighting in the West-End of London—Mr. Denny Lane on Producer Gas—The Affairs of the Edison and Swan Company.

THE references made at last Friday's general meeting by Colonel Makins, the Governor of The Gaslight and Coke Company, to the subject of electric lighting in the Company's district, are not of a nature to reassure those electricians who have been hoping to carve a profitable revenue out of what has hitherto been regarded as the Company's richest preserves. If there is a part of London in which electric lighting might be supposed to do better than any other, it is the "Bond Street quadrilateral," which has on a former occasion been singled out by Colonel Makins as exhibiting in the highest degree the course of the new fashion in artificial lighting. We prefer not to paraphrase the weighty observations of the Governor of The Gaslight and Coke Company in regard to the gas and electric light supply of this particular district, but confine ourselves to the repetition of the truly remarkable statement that since 1889 the Company's revenue from this selected area has improved by the handsome figure of £10,000 a year. This does not look much like the "suppression" of gas by electric lighting, in the one locality of the whole world where the latter might be supposed to do best. Colonel Makins's pungent references to the words and ways of Mr. W. H. Preece may be recommended to the attention of the local authorities who still believe in the vaticinations of the Post Office Electrician.

In another column will be found a letter from Mr. Denny Lane upon the subject of gas for driving engines, in which the recent discussions as to the feasibility of substituting producer for common coal gas for this purpose are passed in review in the writer.s inimitable style. We take credit for having "drawn" Mr. Denny Lane on this interesting topic; and now, unless he can be answered, there is little more to be said on the matter. He supports, in the most emphatic way, our statement that producer (or, as he prefers to call it, "furnace") gas will not pay to distribute. This is a point that cannot be called new, since it is no more than the gist of a lesson

that many unhappy speculators have learnt at great expense. Time and again these lessons need to be repeated, as new generations of speculators arise who seek to adapt old processes to fresh ends. In the case under notice, it is probable that the very men who would admit having heard that fuel-gas supply as a general thing is a commercial impossibility, would argue that the supply of such gas to power-generating stations is something different. So it is, but the question is whether this difference is considerable enough to cover the margin between failure and success. There are several statements in Mr. Denny Lane's letter that might be discussed with advantage; but the tenth paragraph in his category of reasons against the employment of furnace gas cannot be allowed to pass altogether unchallenged. He objects here to our figure of 50-horse power as the superior limit to the economical employment of coal gas for driving engines; and he declares that where gas is sold at a low price this limit may even at present be exceeded. His statement is vague; but, on the other hand, we are not bound to a few horse power, and will amend the figure, to please Mr. Lane, to 60 or even 70 horse power. However, it amounts to the same thing, after all is said—that the economical limit for the employment of town's gas at current prices, as compared with steam for power generation, is reached long before the size of the engines needed for a respectable electric lighting station is attained. After this, the choice of the electrical engineer rests between a gas-producer and a steam-boiler. If he is free to use either on the spot, the former is the cheaper. If the producer cannot be on the same site as the engine, is it economically possible to convey its gas from somewhere else? Granting that the mains for producer gas must be six times larger than those for coal gas, are the former still impracticable in all circumstances? What does Mr. Lane mean, in pounds, shillings, and pence, by the latter portion of his tenth paragraph?

The Edison and Swan United Electric Light Company have held the last of their general meetings for the protected period of their commercial existence. When next the proprietors assemble, the sale of incandescent electric lamps in the United Kingdom will be no more a monopoly. This being the case, it must have been highly satisfactory to everybody interested in the Company to hear from the Chairman (Mr. J. S. Forbes) that the gross receipts for the past year were the largest on record, and that the profit realized was correspondingly great. Moreover, the Chairman declared that the Company will enter upon the period of commercial competition in the lamp trade in a condition of preparedness for a strain which he did not care to deny would probably be severe. In giving a brief history of the Company, the Chairman referred to the era when the Edison and Swan Companies, then independent and at enmity one with the other, did installation business and supplied lighting by contract, and so forth. It is Mr. Forbes's chief claim to the gratitude of the shareholders that he was one of the first to perceive the essentially unremunerative character of electric lighting; and he saved the Company by restricting its operations to the safe trade of making and selling patent lamps to the people who chose to run the risk of using them. Edison and Swan lamps are now a standard article of commerce; and when they are put to it the makers will probably turn them out as cheaply as any rival lamps that can be equally well depended upon to do the same work. The country will be inundated with cheap incandescent lamps from Continental, and possibly also from American, sources; but if the Ediswan trade mark cannot hold its own under the new conditions of the market, the Company will stand convicted of having wasted the opportunity they have enjoyed under the operation of the patent law. They have the advantage of knowing pretty well what their coming rivals will be like, while nobody knows what they can do. It reads quite like a romance of industry that this Company, which ten years ago did not exist, has a capital of £353,478 of subscribed money, and £117,820 in deferred shares. The solid assets, upon the brink of the expiry of the patents, stand at £200,000; and it is an interesting question whether the accumulated experience, capacity for business, and the trade mark which, as the Chairman says, must now take the place of the vanishing patent right, are worth the balance. Mr. Forbes is sanguine enough to believe that they are, and that the increased number of cheap lamps to be sold by the Company will recoup them for the diminution in price. Time will show; but there is reason for the belief that, though the fall in price will tend to increase the sale of lamps, the increase will not be so considerable as Mr. Forbes expects.

Petroleum in Roumania.—It is announced from Bucharest that the Roumanian petroleum concerns have constituted themselves into a syndicate, in order to prevent a further decline in the price of petroleum, and at the same time to better cope with Russian competition.

The Whitworth Institute.—The munificent gifts of the legatees of Sir Joseph Whitworth to Manchester are to be increased by a sum of £50,000. The amount previously given by them to carry out the scheme of the Whitworth Institute was £105,000. The legatees consider, however, that even their additional donation will need supplementing by the public if the Institute is to attain its due importance.

AUTOMATIC PREPAYMENT METERS.

THERE was a passage in the last report of the Manchester Corporation Gas Committee, referring to the subject of prepayment meters, which is calculated to arrest the attention of all gas engineers who are interested in the important movement of which this class of appliances are the executive agents. We refer to the popularization of gas among the small householders who have remained to this day outside the ordinary long-credit system of gas supply. Hitherto these householders have inhabited a region of "darkest England" in which the cheap and dangerous, as well as troublesome, mineral oil lamp has been the only illuminant; and the discovery of this region by certain public-spirited pioneers of gas lighting has deservedly ranked among the achievements of the closing years of the century. The opening up of this new outlet for gas has been attended with some trouble; and, as might be supposed, various opinions prevail respecting the best methods to be adopted for the purpose. This is largely due to the circumstance which has already been recognized and commented upon in these columns, that the proportion and character of the non-consuming householders differ in various towns. A gas manager desirous of extending his services to householders who have not been touched by the ordinary system, must first take account of the nature of the district he has to deal with, and it by no means follows that the policy which satisfies the requirements of one locality will answer everywhere.

The first question that arises is whether any exceptional treatment is needed to extend the popularity of gas in a given district; and, if so, what? Some gas engineers, among whom stands Mr. G. F. L. Foulger, the head of the Distribution Department of The Gaslight and Coke Company, abide as yet by the principle of making as little distinction as possible between the order of what may be designated the assisted consumers and the general body. No deposit is asked for from a respectable householder who can show that his landlord trusts him for his rent; and no special meter is used. The money for gas burnt is merely collected at short intervals. The subject of the provision of fittings is a point of departure in some districts. There are localities where, the houses being new, the piping is laid in, as a matter of course, by the landlord; and this is naturally the preferable way. For it will hardly be disputed that the less the gas supplier has to do by way of interfering with the internal arrangements of houses the better. There are, however, many old towns, and old districts of towns, where the houses, having been built at a period when gas was high-priced, are destitute of gas-piping. It also very frequently happens that such districts have been abandoned by the class of residents for whom they were erected, and have come into the occupation of people who are respectable in their way, but are unable to provide themselves with the luxury of gas-fittings. Here it is evident that special means must be found for bringing the advantages of gas within the reach of these struggling householders; and hence arises the demand for such systems as the fittings supply and prepayment collection introduced by Mr. W. A. Valon at Ramsgate, and for the "penny-in-the-slot" meter.

The remarkable consequence of the introduction, by one or another of these systems of assisted supply, of gas to a fresh stratum of the population, has been to show the avidity with which the comparative poor will take and use gas. It is especially the housekeeper who does not keep a servant who finds the greatest benefit from the gas-cooker. In better houses, these too-convenient appliances are apt to create unpleasantness between mistresses and servants, on account of the extravagance of the latter in the matter of gas. Paterfamilias is prone to explode with wrath when the quarterly gas bills come in, and it is discovered that the cook has loved her handy stove "not wisely, but too well." The lodging-house keeper or the workman's wife, to whom gas consumption is a present matter of pence or shillings, is correspondingly frugal, and is therefore the best friend to the gas-stove maker. And the lighting burners in the same class of establishments, although not numerous, are usually kept well employed.

With the spread of the prepayment meter, especially of the "penny-in-the-slot" variety, comes a new order of gas managers' troubles, the nature of which stands partly revealed in the report already referred to, which mentions "frequent discrepancies between payments made and gas registered, as well as minor defects in the working of the apparatus." It is a delicate task to pass in review the different patterns of these "penny-in-the-slot" machines, which are presumably alone in question here; but it is nevertheless high time that the policy of the employment of these appliances should be discussed in the light of such experience as already exists. It is no insult to the designers of such articles to remark that the suggestion obviously came from the automatic sweetstuff and match-selling machines—the vogue of which is, by the way, a curious illustration of the possibility of reviving an old idea. In many an old country inn, tobacco was sold some forty or fifty years ago by means of coin-controlled boxes; but the device never spread, and the manufacture of these goods probably ceased long before the new fashion sprang up. To return to the sale of gas in this manner, however, it may well be asked whether this is one of those commodities that can be

conveniently dispensed by the pennyworth. The unit of value is so painfully small, that it must needs be multiplied many times in all but the very poorest house of a single light; and this means several things. The first thing is a wheelbarrow, ultimately expanding into a cart, for collecting the coppers, and the necessary attendance, which is an extra to the usual and still indispensable meter inspection. What is to be done with these "useful, but somewhat heavy," coins, as young Middlewick called them, when they are gathered in their thousands at the gas offices? Then there is the question of registration—of those discrepancies mentioned in the Manchester report. In the machines that are now such familiar objects of the railway station, to say nothing of other places of public resort, a very common "discrepancy" is that of declining to yield anything in return for the inducement of the coin; and if this lax commercial morality is also a feature of the automatic gas-meter, it is obvious that its popularity is endangered thereby. Assuming the machinery to be reliable in this regard, however, there remains the difficulty of the "draught" of the apparatus. Unless the consumer's lights are to go out suddenly, which they would be certain to do at some awkward time, there must be a margin at the end of every pennyworth of gas, which would amount to something considerable in a twelvemonth, and would be different in the case of every consumer according to the number of pence he was in the habit of putting in at a time. The question of index taking also becomes complicated. Again, the machine is expensive; and unless the small consumer is charged more on this account for the convenience of buying his gas by the pennyworth, which would be unjust, he is really taking something from the others, which is equally unfair.

We make these observations, not with the intention of throwing cold water" upon the cause of the popularization of gas by the prepayment system, but in order to arouse reflection, and perhaps discussion, upon the means whereby this policy is being carried out. It is difficult to accept the method of sale of gas by pennyworths as satisfying all the requirements of the age in this respect. The meter in every house is, at best, a necessary evil; and the more it is complicated, and exposed to the handling of persons not always careful of other people's property, the more objectionable it becomes. Every additional aid to swelling the proportion of unaccounted-for gas is, moreover, to be objected to. Unless we are misinformed, the efforts of the mechanical prepayment meter makers have hitherto been restricted to dry meters, which puts their work out of the reach of those gas managers who prefer the wet meter. All these remarks of ours must, however, be taken as inviting discussion on the general subject, rather than as instructed criticism. We seek to treat the "penny-in-the-slot" meter as merely a means to an end, and to hold this end up clear from the methods and appliances now employed for its attainment.

Consumers who have internal fittings provided for them by the suppliers of gas should be charged for the accommodation after a rate sufficient to pay interest on the capital outlay, and its redemption within a reasonable period. Whether or not this charge should be in the shape of an addition to the price of gas, is a question of convenience as well as of policy. The great thing is to make assisted consumers understand that there is nothing of an eleemosynary nature in whatever arrangements may be devised for the conduct of this branch of trade, but that the new departure simply means that the supply of gas, which used too often to be carried on uncommercially, as though the application of every new consumer were an outrage upon the undertaking, has at length taken its place among other businesses conducted upon popular cash principles.

The introduction of this cash prepayment system in gas supply puts a fresh aspect upon the old question as to whether or not gas companies should undertake internal fittings. Taking the principle as established, the answer to the question is placed in the affirmative beyond doubt or cavil, with the added endorsement that in this way a gas company might hope to start at once with a paying connection in a district which, under the old system, would not return a dividend for years. Nor is it clear why, with the new principle, any particular kind of automatic or prepayment meter would be required. The writers of text-books of gas engineering construction are fond of imagining a case of a town to be supplied with gas, whereupon they give the rules for proportioning the plant to the population of the district. Let us similarly indulge in imagining a scheme of gas supply, involving the fitting up of every house as part of the capital responsibilities of the venture. There should be no restriction whatsoever upon consumers as to the costliness or pattern of fitting to be chosen, beyond that ordinarily imposed by landlords in such matters as the decorating of houses in a style appropriate to the rental. The gas company should supply and fix everything, from kitchen pendants to engines, at settled scale prices, carrying a definite charge for interest and redemption; and this, with the estimated amount of gas required for every consumer, should be paid for monthly in advance. The only "stop" arrangement should be the main-cock on the service, which should be accessible from outside. Even if a few bad debts were made under this system, the expense to the undertakers would be as nothing in comparison with the ordinary cost of waiting for the development of the concern. There are possibly many objections to this sweeping proposal; but it indicates the direction in which the movement for the popularization of gas is tending.

Automatic meters must stand or fall on their merits. There is no particular virtue about the collection of money for gas automatically—the whole suggestion being simply a way of meeting a recognized want; and it appears to us to be a way that does not carry one very far. The idea of assisted gas consumption implies, as we have endeavoured to sketch out, very much more than copying a sweetstuff-delivery arrangement; and we should like to see it grappled with comprehensively by some engineer having the courage of his opinions. It is certain that the creation of new gas-supply districts by the old system is no longer possible in this crowded country; but whether a new order of gas companies could be launched upon the principle herein expounded, is a problem that has not yet been approached. The conditions exist in several parts of the country; and although the ideal district for trying a new experiment in gas supply may be as impossible to locate as are most other ideals, there is sufficient reality of demand for gas on the part of the fresh order of consumers that has already been secured in many towns to warrant the belief that, if more of the same class of business were sought for, it could be found. Once more, however, it must be contended that the cause of the popularization of gas will suffer wrong if it is tied too closely to the operation of any particular make or kind of apparatus. This is the worst of the sudden coming into fashion of a machine or a system. For a time everybody is infatuated with it, only perhaps to grow tired of it after awhile; and then the cause with which the toy is identified falls into unmerited obloquy. Frankly, if the cause of the popularization of gas lighting among those consumers who require to be assisted to its use were identified with the possibility of selling gas in any quantity by the pennyworth, we should be doubtful of the permanence of the attractiveness of the idea to gas engineers; but happily this is only a step in the right direction. Since it is the first step, which proverbially costs more to make than those which follow it, the designers of automatic prepayment meters deserve to be complimented upon the vogue they have created. It only remains to say that if, in the course of this article, we have pressed unduly hard upon any meter system, we will gladly allow reasonable space for statements in defence.

A Useful Reference Map of the United States.—With the view of assisting engineers visiting America in connection with the Chicago Exhibition, the Committee on Information and Courtesy of the American Society of Civil Engineers have prepared and issued a very useful reference map, accompanied by a list of prominent structures and works in the United States in which their foreign *confrères* may be interested. The little book, which has been got up in a neat form for the pocket, is not put forward as being exhaustive of the great number of manufactures and public works in America, but simply as a general guide for those who may desire to investigate particular subjects and processes.

Coal in China.—One of the oldest (probably the very oldest) of the collieries in China is the Kaiping, which has been worked for the past ten or twelve years. It is fitted with the most approved English machinery, and has an average daily output of 1500 tons; while the output has reached as much as 2000 tons in one day. There are fourteen seams of fairly good coal. One in particular, nearly 6 feet thick is of the finest quality; and this is the one principally worked. The shafts are 600 feet deep, and 14 feet in diameter. Particulars recently supplied to a Government Commissioner respecting the coal workings at Barkoul are of interest. This property is about 4000 acres in extent; and the underground workings are communicated with by means of two vertical shafts, known as the "old" and the "new" main shafts. The former is about 85 feet deep; and the latter, situated on higher ground, 130 feet in depth. The open works show the seam to be from 15 to 22 feet thick; the average being 20 feet. The coal is bituminous, intermixed with layers of anthracite.

The Troubles of South American Gas Companies.—Those of our readers who peruse the reports of the meetings of South American gas companies are familiar with the troubles experienced by the conductors of these undertakings at the hands of the authorities under whom they work. The readiness to impose a fine for the slightest slip on the part of the company sometimes contrasts strongly with the reluctance to recognize responsibilities on the other side, especially in regard to payment of what is due. For an example of the arbitrary way in which these people deal with those who hold concessions under them, we translate literally a paragraph which appeared in the *Jornal do Commercio* for June 28, and to which a correspondent has called attention: "The Joint Stock Company of Gas [the Rio de Janeiro Company] was yesterday fined 500 milreis for an excess of pressure in the mains." This is equal, at the present rate of exchange, to about £25. Now, curiously enough, only about a week previously the same Company were fined a like amount for deficiency of pressure; but what the pressures were, which were the subject of these fines, is not made known. We learn that the Belgian Company of Rio de Janeiro are being constantly fined for equal absurdities—for example, if a light happens to blow out during the night—and all they can do is to pay. It is scarcely to be wondered at that the currency of the country is of little value when the administration of public affairs is conducted in this despotic way.

NOTES.

The Westinghouse Gas-Engine.

Having failed in the attempt to produce a fuel gas that can be sold to advantage, the Westinghouse Company of Pittsburgh have directed their attention to gas-engine manufacture, and have put upon the market a motor for which many advantages are claimed. The aims of the makers of this engine are described as being close regulation under the widest variations of load; an admission arrangement to limit the intake of gas to the proportion necessary to give the power required; a positive and efficient ignition device; compete jacketing and thorough lubrication; and a compact and simple general design. The engine is made in all sizes up to 200-horse power upon the same general pattern, with a pair of inverted vertical cylinders and an enclosed crank chamber half full of a lubricating mixture into which the crank-shaft and connecting-rods splash at every revolution. The cylinders are cooled by a water jacket in the usual way. Every revolution of the engine operates valves admitting the explosive mixture of gas and air to one or the other cylinder and the ignition is electrical. Contrary to the usual practice, the makers rate these engines by their brake horse power; and according to a recent reported test, working with Pittsburgh city gas having a calorific power of only 434 British thermal units per cubic foot, a 9-horse power engine consumed 21 cubic feet of gas per brake horse power per hour. Having regard to the consumption of energy, this is equivalent to an efficiency of 28 per cent., which is a very good result. The efficiency of the machine was 80 per cent. These results apply to an engine worked at only two-thirds of its full power, which is a very ordinary condition. When fully loaded, the consumption of gas is stated to have dropped to 13·2 cubic feet per brake horse power, which showed a total efficiency of 33 per cent.

A Discredited Photographic Law.

Having regard to the attempts that have been made to produce a photographic photometer, it is of importance to record some recent observations of Captain Abney, F.R.S., which exhibit a breakdown of the generally assumed law that "the products of the intensity of the light acting and of the time of exposure being equal, equal amounts of chemical action will be produced." Quite lately, Captain Abney has described his method of comparing the photographic value of sunlight and candle light, which is as follows: A beam of light is admitted through a narrow slit to sensitive bromide paper stretched round a drum about 4 inches diameter. The drum can be caused to rotate at any speed up to about 60 revolutions per second, by means of an electromotor. Part of the experiment consists in placing an amyl-acetate standard lamp in position at any convenient distance from the slit; exposure being given for a fixed time during rotation. The slit is then replaced by a small square aperture, of about ⅛ inch side, and other portions of the same paper are exposed to the amyl-acetate lamp at the same distance, for varying but known exposures, with the drum at rest. On development, the paper shows, among other things, a narrow band of deposit of the width of the slit, caused by the light of the amyl-acetate lamp, and a row of squares of varying blackness of deposit due to the different exposures given with the drum at rest. By comparing the blackness of the band with the scale of blackness, the width of the slit would evidently be calculated, supposing the usually accepted law to hold good in all circumstances. On making such calculations, Captain Abney has found in every case the calculated width of the slit to come out considerably less than it is in reality; the difference being far beyond anything that would be due to errors of measurement. Some experiments were made to ascertain the cause of the difference, and it was found that, with exposures of less than one-thousandth part of a second to the light of an amyl-acetate lamp, the so-called law fails.

An Electric Arc Standard of Light.

It is claimed for Captain Abney, R.E., F.R.S., that, in a report to the Secretary of State for War, which has never been published, he showed for the first time the constancy of the spectral composition of the light emitted by the positive crater in the electric arc lamp, which has since been proposed as a standard of light for photometrical purposes. This constancy of the electric arc spectrum has been proved by Professor Silvanus Thompson to be due to the constancy of the temperature, which is that of the volatilization of carbon—a phenomenon that requires a constant expenditure of energy, and is carried out at a fixed temperature. M. Blondel claims to have demonstrated that the intrinsic brilliancy of the surface of the carbon crater is independent of the density and the molecular structure of the carbons employed. He has carried out a number of determinations of the intrinsic brilliancy of the crater under the most varied conditions of voltage and current, and with carbons of very different nature and composition. For the degree of accuracy attainable in photometrical observations, M. Blondel concludes that, with carbons sufficiently pure, the intrinsic brilliancy of the zone of maximum illumination in the positive crater is practically invariable, and may therefore be used as the basis of a standard of light. For this purpose, an area of the glowing carbon of definite size must be screened off; and M. Blondel proposes accordingly as the arc light standard for photometry a surface of one square millimetre screened from the crater of an obliquely disposed pair of carbons. The amount of this light in terms of other standards is not stated; but it has transpired from another source that the light of a square millimetre of the carbon crater is about 77 candles, while that of a circular millimetre is equal to about 55 candles.

TECHNICAL RECORD.

NORTH BRITISH ASSOCIATION OF GAS MANAGERS.

The Papers and Discussions at the Dundee Meeting.

In the JOURNAL last week, we gave a general report of the proceedings at the above meeting. To-day we commence the publication of the papers and discussions.

Mr. G. KEILLOR (Nairn) read the first paper, entitled—

NOTES ON THE PREPAYMENT METER.

As requested, I have prepared a few notes on the prepayment meter system, with the view of bringing the subject before you for discussion; but having had these meters in use for only about a year, I am afraid my short experience may be of little service, and so perhaps part of the valuable time at your disposal may be taken up unnecessarily. However, I beg to ask your kind forbearance for a few minutes.

This prepayment adaptation to the ordinary meter may be said with truth to be another step in the right direction. The system has already been rewarded with very great success; and it is rapidly finding favour among the poorer class of gas consumers. By this arrangement, "a long-felt want" has been supplied. It is indeed a friend to the poor, and completely eclipses the old, but true, saying "Short accounts mak lang friends."

I may here state that, at a meeting of my Directors held in March, 1892, I had a meter fitted up in the Secretary's office, by which it was shown how a pennyworth of gas could be bought and afterwards consumed. The Chairman expressed great satisfaction with the arrangement; and said he considered the coin meter to be the best invention he had yet seen for the poorer class of consumers, and to keep gas companies from making bad debts.

A short time after this, twelve of these meters were ordered, so that I might experiment with them. These have now been thoroughly tested; and I am pleased to inform you the results were very satisfactory, and also that my anticipations formed with regard to the quantity of gas consumed, and the corresponding pennies in cash-boxes, have been more than realized. I may, however, state that I had very grave doubts as to the meters possibly being troublesome to consumers, by the light going out at a busy moment, or that the slot arrangement might get out of order, and so pass a greater quantity of gas to the consumer than the money value in the cash-box; but in practice I find these apparent doubts and inconveniences entirely disappear. The consumer gets so well acquainted with the working of the meter, and the time his one, two, three, or more pennies' worth will last, that he likes the system, and is put to no inconvenience whatever. On one occasion only we had to take in a meter which ceased to give light; the cause of which was found to be a penny stuck in the slot—the penny having been by some youth hammered into an irregular shape—which necessitated our taking the cover of the meter off. Makers should therefore enlarge the slot a little, as it is not necessary for it to be the exact size to admit the coin.

When ordering these twelve meters, it was not my intention at first to press for new consumers; and, of course, we had no applications for them. But it occurred to me that, rather than give them to new consumers to commence with, I might select twelve ordinary small consumers, who were all more or less in arrear, and consequently would have been more than likely to have their gas supply cut off. Rather than do this, and very probably lose all, I used some liberty with these defaulters, by way of making an experiment with the prepayment meter. Most of them were glad to get such a meter; while several others absolutely refused to allow their meters to be shifted, and declared, if such were done, they would commence using oil. Notwithstanding these remonstrances, I insisted on having the meters put in; and, strange to say, on making our periodical calls three months after, we did not find oil in use, neither did we find the cash-boxes of the meters by any means empty. On the contrary, nearly double the quantity of gas had been paid for than would have been consumed by the ordinary meter; and this without a word of complaint. One consumer remarked: "I doubt you have given me a stick to break your own back with. You will not get me overcharged this time, as you did the three corresponding months last year. I have only put in a few pennies each time I needed light; and that was no oftener than I could help." However, on reading the meter, the Inspector considered that, if the pennies in the box agreed with the number of feet registered, the Gas Company will have no reason to complain; and the consumer also was apparently well satisfied. The result was 12s. in the box as compared with 7s. 6d. the corresponding months complained of.

To show how accurately the arrangement works out, compared with the ordinary index-reading, I have noted down the results of the first two quarters. From Nov. 1 to Feb. 1, the twelve meters indicated a total consumption of 13,200 feet. This, at the rate of 10 feet a penny, or 8s. 4d. per 1000 feet, makes a sum of £5 10s. value registered; while the money taken from the meter cash-boxes was £5 10s. 5d.—being 5d. more cash than the number of feet registered amounted to. This extra 5d. was accounted for as having passed through the slot, to pay for gas not yet consumed. The average per consumer was thus 9s. 2d.; and this with consumers of one burner each. Again, the same twelve meters for the quarter from Feb. 1 to May 15, indicated a total consumption of 11,200 feet, being £4 13s. 4d.; while the cash in the meter boxes was £4 13s. 11d. This time, therefore, there was 7d. more than the amount charged for the gas consumed.

Our ordinary price is 6s. 8d. for lighting, and 4s. 2d. per 1000 feet for heating and cooking, &c.; but to cover the extra cost of the meter and meter-rent, we set our prepayment meters at 10 feet a penny—being 8s. 4d. per 1000 cubic feet, or 1s. 8d. above the ordinary price. The makers sent out some time ago a circular-letter in which they say, regarding their prepayment meters: "Gas so supplied is generally sold at a slightly higher price than is charged for it through the ordinary meter, so as to cover interest and other charges; but this is a small matter compared with the advantage to the consumer. The increased rate should include meter-rental, to obviate extra charges, which are unpopular with the consumer, who has, in this case, only to place a penny in the slot, and procure a certain quantity of gas." I have merely given these few details to show how accurately the measuring of a pennyworth of gas at a time compares with the index-reading at the end of three months. Also that there is an increase of gas consumed, to the extent of about 33 per cent. over the ordinary meter, and that these consumers are much more satisfied.

I have now only to say that gas companies and corporations ought to give notice, by advertising or otherwise, to all proprietors, architects, and builders, that, when erecting new buildings or when altering old ones, the gas company will supply automatic meters to be fitted into all workmen's houses. Also that, when architects specify the plumbing and gas-fitting work, it should be specially mentioned in the specification, to the effect that a meter and suitable gas-bracket will be fitted up complete, by the gas-fitter, after which the gas company will send an official to instruct the tenants as to the working of these prepayment meters. In Nairn, among other buildings, I did the architectural work in connection with a block of houses where there are twelve tenants. In the specification of plumbing and gas-fitting work, it was specified that one automatic meter must be fitted complete into each house—the meter to be supplied by the gas company, and fitted in by the contractor. I know very well that none of these twelve tenants had any intention of using gas when they rented these houses—most of them, in fact, informed me they did not want the meter placed. But, on discussing the matter with them, I said it was part of the gas-fitter's duty to fix these meters; and that they had better allow the meter to be put in in the ordinary way. I also took the opportunity of saying that perhaps the first time they were out of oil, or it may be a lamp chimney got broken, they might for a change put the value of the new lamp chimney in the slot of the meter; and by so doing they would come to see how handy and ready the gas is when obtained in this way, compared with oil. I remarked that ultimately I expected to see an ornament on each of their shelves, in the shape of an oil-lamp.

Well, whether or not you believe the system to be just as successful as I do—a great deal of which success depends on gas managers themselves—there is one thing certain, that the cleanliness, readiness, and easy purchase of the light by this system will go on finding favour among the poorer classes; and I most certainly recommend the system wherever gas is used. And, further (more especially in small towns), I would say should this class of consumer not get the opportunity to use gas by this system, we shall be guilty of what I am afraid we too often are—viz., "standing in our own light."

Discussion.

Mr. W. A. Valon (Ramsgate) said he had not anticipated that he would be asked to make a few remarks about the prepayment system of meters. He agreed with their friend who had read the paper, that there was not the slightest doubt that they were moving in the direction of introducing more of these things day by day. Some companies had gone very largely into the question. He had himself worked on the same principle as the author of the paper, but not with the identical meter. In his opinion, it was better to put a stop on the index, for a certain amount of money in advance. He had used these "penny-in-the-slot" meters; but he did not think they gave him the satisfaction which their friend had described. He found, first of all, that the instruments themselves were somewhat expensive; and besides they were liable to derangement. Of course, these were all things that might be overcome; and he had no doubt they would be. The President, in his address, mentioned a certain town where there were 10,000 of these meters employed. He did not know if it was the same town he referred to; but he knew a place where there were something over 7000, and he understood that they were so far unreliable that an agreement had to be made with the consumer that not the number of pennies in the box should be the indication of the quantity of gas consumed, but the index itself—it being found that every quarter about 15 per cent. of these meters were wrong. That was to say, that there had to be an adjustment of accounts in about 1000 out of 7000 cases. This was a serious drawback. Some had to pay more, by finding that the amount in the box did not agree with the index; and some had paid too much, and this had to be returned. But he thought there was another point which was equally important in connection with the prepayment meter, if he was not going outside the range of the paper, and that was that, in cases where fittings did not exist in houses, it was all very well to ask builders and contractors to put pipes in. Sometimes they would not, and sometimes they did; but he thought it was there that companies might come in and assist poorer people to burn gas. It was not a very serious matter. It cost about £3 on an average for a house of £12 to £30 a year rental—that was to say, that for £3000 they could secure 1000 consumers. He did not believe there was any gas company who would not pay £3000 of invested capital to secure this number of consumers. He certainly must think, seeing that he took this meter in hand some years ago, that it was a step in the right direction. He did not know that it altogether depended upon meters of that class; but he did say that shorter payments, arrangements with consumers to collect their accounts oftener, the fitting up of houses, and the giving to that part of the public who had not hitherto been able to use gas the opportunity of burning it under easy conditions, were directions in which all companies and corporations ought to move.

Mr. J. Hepworth (Carlisle) said it was very good of the President to give him the opportunity of speaking at that meeting; but he was sorry his experience did not enable him to add anything of much value to the discussion. He agreed with the observation of the author, that they did stand in their own light whenever they failed to take the opportunity of furthering the consumption of gas. He happened to be Gas Engineer in a town where the consumption was very extensive—he meant where the number of consumers was greater than perhaps it was in most other places in proportion to its population; and they never felt the necessity of adopting the prepayment system. But he quite believed in everything that had been said in its favour; and he should not be afraid of a possibility of error in 15 per cent. of the number of meters, because he took it that this was almost incidental to the initiation of the system. A very little time would doubtless put these meters right; and the experience that had been detailed in the paper read to them was in itself most encouraging in this respect.

Mr. D. Vass (Portobello) said he shoul d like to relate one experiment he had made with a prepayment meter. That meter had been connected to a gas cooking-stove; and it had been found to be very serviceable in this respect—that there was a servant in the house, and the mistress could control the quantity of gas used in cooking by the number of pennies that she gave to the servant. There was one point in Mr. Keillor's paper he was not very sure about—the amount he added on, to cover meter-rent. He thought they should keep this limit as low as possible; and his reckoning was—he had only gone into it on a small scale—that they should count upon 3000 cubic feet per annum, and that their charge should be perhaps about 2s. for meter-rent. That for a year, covering 3000 cubic feet, would run to about 8d. per 1000 feet beyond the price of gas. There was one point about these appliances—viz., that they had them always fitted on to dry meters; and if the consumption was anything like irregular—if it were stopped, for instance, for a few months in the year—he should fear that there would be a stiffening of the diaphragm of the meter. He had asked if he could not be supplied with wet meters; but there seemed to be a difficulty in fitting the prepayment appliance on to such meters. He thought, if they had it upon a wet meter, there would be more confidence among gas managers in recommending it. He had no hesitation in saying that it worked very well as it was, except for the drawback he had mentioned. Then, again, he thought that it should only be applied to new consumers. They had perhaps 1000 consumers in a town; and if they were to be asked to put in prepayment meters to all these, what were they to do with the old meters, some of which might have been in use for only five or six years?

The President referred to the fact that there were one or two prepayment meters there for exhibition; and any gentlemen who had not seen them at work, would have an opportunity of inspecting them in the interval.

Mr. D. Cheyne (Mountain Ash) stated that he had had a little experience with these meters; and he could endorse every word Mr. Keillor had said. He had had them in use for about three years; and he found that people, while they put in double the quantity of what their bill used to come to, never said a word about it. If they were to present a bill for (say) 5s., there would be grumbling; but consumers would put in 10s., and never make a single remark. So far as registering the quantity corresponding to the pennies put into the box was concerned, he had found no trouble at all with that. He once had a stop, but it was owing to a penny being bent; and after that he cautioned people always to put in perfect pennies. He might

also say he found a two-shilling piece in one of them, which, of course, he returned. The way they managed was this: They charged a penny for 20 cubic feet; and as their price was 3s. 9d., this represented 5d. per 1000 feet towards the expense of the meter. They had the money at the end of the year; and if there was anything over and above paying the meter-rent, they returned it to the consumer. It ought to be done in that way, because there were no bad debts and no risks to be run; and he found that there were often a few pennies to be returned at the end of the year. In the case of cookers, he thought the prepayment system very suitable for persons who went away to the seaside for a time. They would sometimes have a great row with such people, who said they did not use the quantity of gas because they had been at the seaside most of the time. Well, he believed these meters were the right things; because, when the family went away, they had only to put so many pence into the box, and then if the housekeeper were extravagant she must find the money for the gas out of her own pocket.

Mr. A. MacPherson (Kirkcaldy) said he could not add anything to the discussion, having had no experience of prepayment meters; but he had no doubt that they would very soon take their place in gas-works. It was quite evident that by that system they would be able to save a considerable amount of bad debts; and there was no doubt that there was a grievance against cookers on account of the waste that servants were guilty of, which could be obviated by the fixing of a prepayment meter. If they were able to say to a lady, when they gave her a cooker that she could regulate her daily supply by this means, they would have more of them disposed of. He must say that he highly commended Mr. Cheyne's honesty in returning the few coppers that were over at the end of the year; and if all consumers were treated in that way, they would very soon become friendly to prepayment meters. It certainly said a good deal for Mr. Keillor, that he had been almost the first in Scotland to introduce these meters.

Mr. R. Cowie (Tillicoultry) said he was very pleased to hear the paper read by Mr. Keillor, and was prepared to endorse everything he had heard regarding it. He had had some little experience with prepayment meters, having fixed about eleven of them for new consumers—that was, people who had never burned gas during his sojourn in the place where he was—and they had given the utmost satisfaction. With regard to the gas consumed and the money tallying with it, he had had no difficulty whatever. He might say that some parties applied to him for gas who were improvident in their habits; and he showed them what the cost would be with an automatic meter. They said they would be very pleased to have it; and he therefore had one fixed up. The first quarter he had 9od.; and the second quarter—from November to February—13s. They were quite delighted with the meter, and stated that they would not part with it on any account. He had had some fixed in a house occupied by single women working in factories, who had had gas-grills supplied to them. They never used a penny-worth of gas for lighting, as they burned paraffin; but they cooked with gas, and they said they would not do without it under any circumstances. He had been deluged with applications for automatic meters. He had over a hundred applications by people already burning gas; but he demurred to supplying them to present consumers.

Mr. W. Chalmers (Alva) remarked that he had had some experience with prepayment meters, and they had given satisfaction. The money and the registers tallied; and he never had had any trouble with the meters stopping.

Mr. J. M'Crae (Dundee) said there was one point which had not been brought out, although he had been waiting for it. It had always appeared to him to be a great hardship upon poor consumers of gas that they should have to lodge a deposit. In Dundee, people could not get a supply of gas unless they paid a deposit or had a guarantee. It was a most difficult matter to find in a strange town anybody who would be security for them; and it was also a great hardship to pay 5s. or 10s. down before they could obtain a supply of gas. But the "penny-in-the-slot" would get them a supply; and they could pay as they went. These meters would be a great convenience to such people.

The President thought they had had a very happy discussion upon the paper. He had one or two prepayment meters in use; and there could be no doubt that these appliances were destined to supply a want in the business of selling gas. There was no doubt about it; and it would be a great boon to the honest poor. Some poor people, if they could get a meter, would burn away at the gas without caring whether or not they could pay for it; but they had honest poor, who were frightened to burn gas for (say) three months without paying for it. Gas was not like any other commodity. They consumed it, and they had the light; and it was then past and gone before they had to pay for it. Mr. West had just informed him that in London these meters had taken a tremendous hold, and that the London Gas Companies had given manufacturers orders to send in as many as they could possibly make. He did not believe there could be any difficulty about producing a reliable meter, either dry or wet; and he should think it ought to be very easy to adapt the stopping principle to a wet meter. They knew that some wet meters were not very difficult to stop without automatic appliances; and, in his opinion, it was only a question for the manufacturers whether they would make these meters wet or dry. He fancied, however, that wet prepayment meters were made at present. He was very pleased that they had had such a good discussion, because he was himself responsible for the reading of the paper; and he could assure them that he had very great difficulty indeed in persuading the author to come forward with his few notes. It must, therefore, be very gratifying to Mr. Keillor that his communication had raised such an interesting discussion. Mr. Valon, he thought, was the one exception; he was the only gentleman who had given them his experience as to the questionable reliability of these meters. He (the President) did not see how they could fail, seeing that they had always the ordinary index of the meter to fall back upon. If the consumer were really honest, and they found that there were not enough pence in the box to recoup them for the quantity of gas indicated on the ordinary index, he thought they would not have much difficulty in persuading him to pay the difference.

Mr. Keillor, in replying, said that the only thing he had to refer to was that, so far as the merit of the meter was concerned, he would not like his price to be taken at all, because he lived pretty far north. He put on 1s. 8d. simply to keep himself right in an experiment; but he thought 8d. or 10d. per 1000 cubic feet would be a sufficient charge for meter-rent.

Mr. W. Young (Peebles) then read the following paper:—

THE PRINCIPLES OF THE PRODUCTION OF ILLUMINATING GAS FROM LIQUID HYDROCARBONS.

Owing to the enormous supplies of high quality natural petroleum oils, our native industry of artificially producing mineral oil from shale by destructive distillation has lately suffered severely, more particularly in respect to that part of the distillate of the paraffin oil having a high specific gravity which was manufactured into lubricating oils; and especially where the shales necessarily produced oils of low viscosity. So much was this the case that in several works they were almost unmarketable, and were used as fuel under the steam-boilers. Many attempts had been made to employ those oils of high gravity for the production of illuminating gas; but, owing to the high percentage of carbon in their constitution, they gave so much trouble from sooty, pitchy deposits in the gas-producing apparatus, that they could not be economically used by existing commercial processes. At the instigation of Mr. John Fyfe, of Young's Paraffin Light and Mineral Oil Company, I, with the assistance of Mr. Bell, made a series of experiments with the view of discovering some method of manufacturing illuminating gas from such heavy oils, without the accompanying inconveniences. Mr. Bell is to read to you to-day a paper upon the process, which has been the practical outcome of these experiments; and I thought I might usefully premise his paper by a few remarks upon the principles relating to the production of gas from oil, more particularly those which guided us in our experimental work.

I have on several previous occasions given to this and the Association now merged in it my views and the results of experiments relating to the principles of the production of illuminating gas, more particularly from coal and shale. They also, however, apply to and embody most of the principles which have formed the basis of our experiments in producing illuminating gas from heavy hydrocarbon fluids. I will therefore refer you back to those prior communications for details; dealing in my present paper only with broad principles, and taking them in the following order:—

(1) The manner in which heat acts upon hydrocarbon vapours in bringing about their decomposition into gaseous compounds.
(2) The conditions modifying the decomposing action of heat: (*a*) Temperature of heat; (*b*) time occupied in effecting decomposition; and (*c*) the atmosphere in which decomposition is effected.
(3) Constitution of the resulting compound due to these various causes, in relation to the greatest illuminating power obtainable in the form of gaseous compounds from a given quantity of hydrocarbon fluid.

At a meeting of the West of Scotland Association of Gas Managers held at Kilmarnock in September, 1878, and again at a meeting of this Association held at Perth in July, 1880, special reference was made to the manner in which heat acted upon hydrocarbon vapours. The theory then advanced was that it acted in two ways—first, by direct contact between the molecules of the hydrocarbon vapours and the heated surfaces in the retort, and secondly, as radiant heat upon the molecules of the hydrocarbon vapour in the free space over the coal; that there was an essential difference in the products from a given hydrocarbon, dependent upon whether or not the decomposition was effected by heat communicated by contact, or by heat in the radiant form; that surface contact led to an indiscriminate shattering of the hydrocarbon vapours, or at least to the production of a different class of compounds from those which were produced by the action of radiant heat; that radiant heat did not act upon a complex mixture of hydrocarbon vapours indiscriminately, but that the waves of heat from the walls of the retort were selective—passing freely through the elementary gases and simple vapours, but acting more and more vigorously upon the molecules of the hydrocarbon the higher their complex structure, leading to their decomposition into simpler bodies.

Practical experience in many operations bears evidence that there is some truth in the theory. For instance, the effect of surface contact in bringing about an indiscriminate shattering of hydrocarbon vapours was well illustrated in the Malam process, and also in the case of one of my early attempts, along with the late Mr. Scott, of Musselburgh, to improve the system of carbonizing coal. By both arrangements, the volatile hydrocarbonaceous vapours and gases coming from the coal were passed through a mass of incandescent coke, with the like results—the shattering up of the hydrocarbon vapours into a large volume of almost non-luminous gases and a quantity of sooty pitch, which gave an endless amount of trouble from the choking up of the apparatus. These two processes were repeats, in principle, of a legion of similar ones which had gone before, including those oil-gas processes where the decomposition of oil was brought about by red-hot surfaces in the production of gas. They all failed from a like cause. The action of radiant heat upon hydrocarbon vapour in a free space is illustrated when retorts are worked with light charges, leaving a considerable empty space over the coal. There is little doubt that the superior results obtained under such circumstances are, to a large extent, due to the selective action of radiant heat acting upon the complex hydrocarbon molecules decomposing them, and leaving the simpler hydrocarbons unaffected; and I have no doubt that the same remarks apply to what is known as the Dinsmore process, where the hydrocarbon products from a series of retorts are made to pass through what is called an empty duct, and that any improved result obtained is due to a like cause. In short, out of the very large number of systems of carbonizing coal or oil for the production of illuminating gas, none of them have proved successful that had not a vacant space in which radiant heat could act upon the hydrocarbon vapours.

In the early days of the shale oil industry, horizontal retorts, in which there was a considerable empty space left, were employed for the destructive distillation of shale. The resulting oil was small in quantity, had a low specific gravity, contained a large percentage of hydrocarbon, having a low boiling-point and a small quantity of the solid paraffins; and there was produced a large volume of illuminating gas. All these results point to the effects of radiant heat upon the hydrocarbon vapours in the empty space over the shale in the retort. When vertical retorts came to be used, in which the shale completely filled the retort, the resulting oil was larger in quantity, higher in specific gravity, contained a considerably larger percentage of the solid paraffins, and less of the oil having a low boiling-point; and the make of gas was considerably less—all pointing to a smaller decomposition of the hydrocarbon vapours from the shale. The object of the shale oil distiller is to conserve the hydrocarbonaceous constituents of the shale in the liquid form; and he has abandoned every shape of retort that had a free space in which radiant heat could act upon the hydrocarbon vapours.

Even in the subsequent distillation of the oils in the process of refining, it was observed that a large amount of decomposition took place, that there was produced a considerable volume of permanent gas, and that the greater the free space in the still over the oil, the greater was the destructive decomposition. When the process of distilling the oil was made continuous—running the oil into the still at the same rate that they distilled out, keeping a very small free space over the oil in the still—the decomposition was reduced to a minimum. On the other hand, the decomposing action of radiant heat in the vacant space in the still was utilized in cracking up some of the heavier oils which had a low market value into lighter oils of greater value. To accomplish this object, large stills were employed, and only the bottom of the still exposed to the fire was covered with the low-priced oil to be decomposed; and the temperature applied was just sufficient to slowly volatilize the oil into the vacant space, where the vapours exposed to the radiant heat were gradually decomposed into more volatile oils, which passed from the still to the condenser. In some cases a fractionating arrangement was placed between the still and the condenser, by which that portion not sufficiently cracked up was continuously returned to the still, to undergo further decomposition.

The decomposing action of heat upon a hydrocarbon vapour may be considerably modified by a number of conditions. For example, the temperature of the heat; the time for which the hydrocarbon is exposed to the decomposing action of that heat; and, in the case of some of the processes by which illuminating gas is produced from hydrocarbon fluid, the atmosphere in which the decomposition is effected. The factors of time and temperature are well illustrated in the process of cracking up the heavy hydrocarbons into lighter ones, to which I have just alluded. We there saw radiant heat of any low temperature applied for a long time bringing about the cracking up of the complex molecules of the heavier oils into the simpler molecules of lighter oils suitable for the manufacture of lamp oils. The same result could not be obtained by a shorter exposure of the vapours of the heavier hydrocarbons to a higher temperature. The heat of higher temperatures applied for a shorter period of time in a shallow free space would produce a different class of products altogether. The action of heat under the two conditions may be likened to that of the use of gunpowder and dynamite in blasting rock. The comparatively slow explosion of gunpowder would simply tear the rock into large masses suitable for building purposes, whereas dynamite, on the other hand, would shatter the rock into useless fragments. If, during the process of cracking the heavy oils, the conditions were modified by admitting an atmosphere of dry steam into the free space in the still among the hydrocarbon vapours, the cracking up of the vapours would cease, because the molecules of steam would take up a part of the molecular motion of the hydrocarbon vapour imparted to it by the radiant heat, and prevent it, so to speak, from being shaken to pieces to form the simple molecules of lighter oils. Steam, under such conditions, has a protective action. If, however, on the other hand, the mixed water and hydrocarbon vapour were exposed for a short period of time to heat of a temperature sufficiently high to decompose the water vapour in the presence of the hydrocarbon vapour, then mutual decomposition would take place; the oxygen of the water vapour going to the hydrocarbons, setting free hydrogen, and producing hydrocarbon gases and vapours and carbonic acid or carbonic oxide in varying quantities, dependent upon the temperature.

Various processes for the production of illuminating gas from hydrocarbon fluids, based upon the reaction between steam and a hydrocarbon vapour, have been tried; the desired object being the utilization of the surplus carbon present in all, and particularly in heavy oils, to produce water gas to dilute the rich hydrocarbon gas. Had it proved possible to confine the action between the steam and the hydrocarbon vapour to the purely surplus carbon, the process would have been an ideal one. Unfortunately, however, at the instant of mutual decomposition, the oxygen of the steam does not confine its operation to the surplus carbon, but goes direct at the hydrocarbon; bringing about the destruction of a large quantity of illuminating matter. Besides, the carbonic oxide produced has a destructive effect upon the illuminating constituents present in the gas, probably due to the combustion of the carbonic oxide taking place simultaneously with that of the illuminating gases, or even to the carbonic oxide remaining unconsumed until the hydrocarbon has been partially decomposed, and only being consumed in the upper part of the flame, and thus acting on its illuminating portion as an inert gas. These remarks also apply, more or less, to the production of illuminating gas, by injecting or commingling a hydrocarbon fluid with coal during the process of carbonizing. Undoubtedly the large volume of hydrogen and marsh gas present has the effect of, to some extent, protecting from over-decomposing the hydrocarbon vapour. The water vapour, however, which is more or less present, leads, by its interaction with the hydrocarbon vapour, to considerable loss in illuminating power. There is also little doubt that the very large heating surface and the comparatively small free space lower the total illuminating value obtained from a given quantity of hydrocarbon fluid.

When shale is carbonized direct for the production of gas, the volatile hydrocarbonaceous products are decomposed in the presence of the water vapour simultaneously eliminated from the shale. The largest illuminating power obtainable under such conditions will not exceed 40 candles. If the same shale is distilled at a temperature sufficiently low to prevent to a large extent the interaction between the water and hydrocarbon vapour, so as to produce mineral oils; and if these oils are isolated from the water, and subjected to decomposition, gas having an illuminating value twice as great as that realized from the direct carbonizing of the shale is easily obtained—showing the great deteriorating effect of the presence of water vapour during the decomposition of a hydrocarbon vapour into illuminating gas. On the other hand, in those classes of processes where illuminating gas is produced by decomposing hydrocarbon vapour in an atmosphere of water gas, heat of a high temperature can be employed to do the work of decomposition, as the effects of the heat are very much modified by the molecules of the inert gas taking up part of the motion communicated to the hydrocarbon vapour by the radiant heat, and by acting as a cushion in preventing the shattering action of heated surfaces. It, however, requires careful adjustment between the temperature of the heat and the volume of vapour in relation to the volume of inert water gas, to bring about just that amount of decomposition of the hydrocarbon vapour that is desirable; and this difficulty is accentuated in those processes such as the Lowe, where the operation of producing gas is intermittent, and where the surface to decompose the hydrocarbon is heated by the producer gas from the water-gas cupola. At the commencement of the gas-producing period, when the surfaces are highly heated, there is a tendency to over decomposition, with the production of soot; and before the end of the period, a considerable quantity of the hydrocarbon vapours is not sufficiently decomposed, so that only for a period in the middle of the run are the conditions suitable for the purpose aimed at. There is, besides, the difficulty, of condensing the very large volume of gas, and separating from it the condensed hydrocarbons, which are in so finely divided a state that they keep floating forward long distances in the current of gas.

These defects are to some extent compensated by the simplicity of the process; the large volume of gas that can be produced on a given space in a given time; and also by the fact that the water gas takes up and holds in diffusion volatile hydrocarbons that would otherwise assume the liquid form. And if the process discovered by Professor Lewes, for the production of illuminating gas by simultaneously decomposing

hydrocarbon liquids and producing pure hydrogen from steam by means of metallic iron, proves as successful as the results obtained at Aldershot would indicate, those objections would be still further removed. Improved results would also be obtained by applying the principles embodied in the Peebles process to that class of processes. Owing, however, to the deteriorating effect of carbonic oxide (due probably to the causes to which I have already referred), the same value in the form of a purely enriching agent will not probably be obtained by any combined hydrocarbon water-gas process as can be secured from the oil decomposed by itself. Besides, from what I have already stated, it will be evident to you that the decomposition of hydrocarbon fluids is far more under control when they are decomposed by themselves.

I have, in my previous papers, on several occasions spoken of the advantages of fractional decomposition and fractional condensation; and I have again to ask you to note the advantages of the application of those principles in the decomposition of such hydrocarbon fluids as are at our disposal. The hydrocarbon fluids—especially such as are used in the production of gas—are never homogeneous. Those at our control are the various grades of natural and artificial mineral oils or tars, which are all mixtures of various hydrocarbons, and each of which probably requires heats of different temperatures to economically convert them into permanent gaseous compounds. Under such conditions, it is very probable that the best results will be obtained by subjecting each hydrocarbon to the temperature appropriate to its gasification with the least amount of deposited carbon; and even allowing the hydrocarbon to be homogeneous—say, a higher member of the paraffin series—in order to decompose it into gaseous compounds with the least loss, it would require to be cracked up in successive stages. In order to accomplish that object, it is necessary that it should undergo a succession of decompositions by which part would be gasified; thereafter cooling the resulting products so that the condensable matter may be again returned to the retort, to be subjected to decomposition for further gasification—the alternate process being repeated till the whole hydrocarbon was resolved into the highest quality of permanent gas, with the smallest deposit of solid carbon. This fractional method of decomposing the hydrocarbon fluid has the further advantage that the quantity of carbon set free at each operation is small; and the large quantity of liquid accompanying the gasified portion washes any solid carbon back into the retort, and leaves it there in a compact form. Thus one of the greatest difficulties experienced in the decomposition of liquid hydrocarbons, containing a large excess of carbon in their constitution, is completely overcome, enabling crude tars and tar oil to be as easily converted into illuminating gas as the most refined volatile hydrocarbons.

This now brings us to consider what are the best class of hydrocarbons to aim at producing, so as to obtain the greatest possible illuminating matter in the gaseous form from a given hydrocarbon. There is no doubt that the constitution of the liquid hydrocarbon employed will have a considerable influence upon that factor in the problem. Commencing with a series of comparatively saturated hydrocarbons, the decomposition can be regulated stage by stage to that desired. It is very different, however, starting with a complex hydrocarbon like coal tar or tar oils, containing various groups of hydrocarbons, which have already been so altered by heat that the process of converting them into the gaseous form necessarily involves, in the operation of cracking, the setting free of a large part of them in the elementary condition of hydrogen and carbon. It has also been considered whether the resulting products of decomposition are to be rendered permanently gaseous by themselves, or whether the resulting gases are to consist of partially gasified hydrocarbons held in diffusion through water gas. At a meeting of this Association held in Edinburgh in July, 1879, I read a paper on the proportion of carbon present in a gas in relation to its illuminating power, which directly bears upon this subject. Attention was then drawn to the relative illuminating power of carbon, combined with hydrogen in the form of paraffins, olefines, and the aromatic group of hydrocarbons. It was then shown that, by the splitting up of a paraffin into an olefine and free hydrogen, the illuminating power was largely increased; and in the same way, the illuminating power of the same paraffin, when split up into benzole and free hydrogen, still further increased. But it also shows that the benzol could not be kept in the state of diffusion at ordinary temperatures, by the quantity of hydrogen set free in the splitting-up process, assuming in all cases no carbon was set free.

Now, the tendency of radiant heat is to split up a complex paraffin into a simpler paraffin, and olefines; and this process of splitting up goes on till the paraffin is cracked into a series of olefines and the lowest members of the paraffin group CH_4, which is a very stable compound. On the other hand, we have observed that heat communicated by surface contact to a paraffin has a tendency to produce hydrocarbons of the benzol group. These observations would indicate that, when the hydrocarbon gas has to be used alone, or as an enriching agent to increase the illuminating power of a coal gas, whatever the constitution of the hydrocarbon, the decomposition by radiant heat in free space with a limited amount of surface would be the best method; and that, on the other hand, when the hydrocarbon vapours are decomposed in an atmosphere of water gas, and where time and available space have to be considered, and where the resulting products of decomposition are to be held in diffusion by water gas, under such conditions surface decomposition may be more freely employed. With heavy hydrocarbon fluids, however, which deposit a large quantity of solid carbon during decomposition, surface contact cannot be economically employed.

Among my earliest communications to the West of Scotland Association was an unfinished paper left in my hands on the death of my brother-in-law, Mr. Cusiter, of the Dalkeith Gas-Works, who, a short time before his death, had been appointed one of the Committee to investigate into the matter of obtaining a substitute for water in wet meters. Amongst the materials tried was intermediate paraffin oil; and he was surprised to find that the oil reduced the illuminating power of the gas to a large extent. Investigation showed that the result was due to the absorption of the volatile hydrocarbon liquids diffused through the gas by the oil. I have no doubt many of you will remember some of the papers I have communicated on the subject, showing how that observed fact of the solvent affinity of oil for hydrocarbons was turned to the practical purpose of recovering the hydrocarbons from waste gases in the distillation of shale, and also how it suggested improved systems of condensing our coal gas, by which the solvent affinity of the heavy tars was avoided and a greater quantity of hydrocarbon vapours left diffused through the gas, thereby increasing its illuminating power. That same observed fact is now being applied to, and forms one of, the principles of producing illuminating gas from mineral oils. As you are aware, illuminating gas produced from mineral oil, owing to the presence of any large volumes of volatile hydrocarbons present in the product of decomposition, is liable to be supersaturated with those volatile products, and such gases are apt to deposit their surplus hydrocarbons under the conditions to which they are exposed during distribution. The principles of fractional condensation, in conjunction with the solvent affinity of the oil, when properly carried into effect, completely overcome these difficulties; and a permanently gaseous compound can be obtained which will resist all climatic and other changes.

There are other points of interest in connection with the principles of the production of illuminating gas from oil; but the time allowed prevents me saying more on the subject to you on the present occasion.

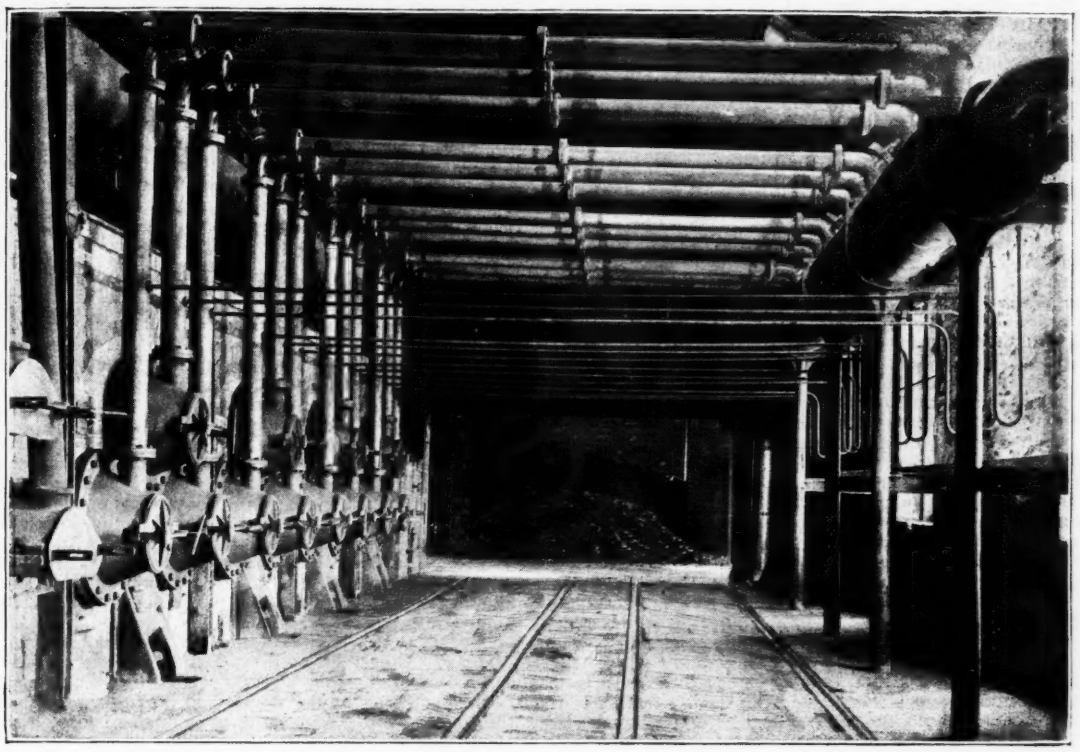
Mr. A. Bell, jun. (Peebles), next read the following paper:—

THE PRODUCTION OF ILLUMINATING GAS FROM LIQUID HYDROCARBONS BY THE PEEBLES PROCESS.

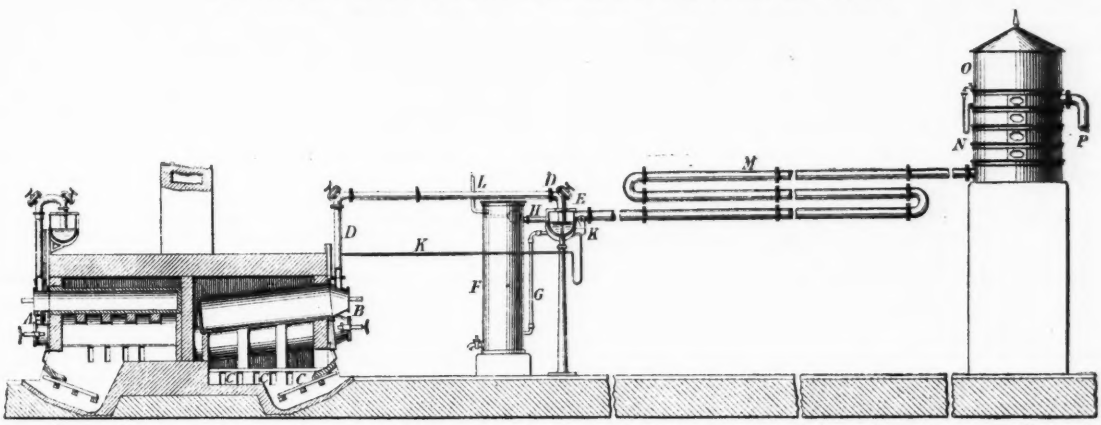
In the instructive paper to which the members have just listened, Mr. Young has communicated to them the principles of the decomposition of liquid hydrocarbons in the production of illuminating gas, and in particular those principles on which the Peebles oil-gas process is based. It therefore only remains for me to explain the manner in which these principles have been carried into effect, and to give the results obtained from the practical working of the process.

Before proceeding, however, to describe the accompanying diagram, I may state that, in the experimental operations conducted at Peebles, vertical, horizontal, and inclined retorts were all used, also various forms of condensing and washing arrangements, each of which was found to be equally well adapted for carrying out the process. Of course, in practical working, the form and arrangement of the apparatus will depend to a great extent on the conformation of the works into which it is to be introduced, and the purpose for which it is to be used. Where, for instance, it is desired to economize space, the retorts may be vertical, instead of horizontal; and so with the condenser, which moreover may be combined with the scrubber to form one piece of apparatus.

But perhaps the simplest of all arrangements is that shown on the diagram, which, with a slight modification, is actually the plant in operation at the Galashiels Gas Company's works. A glance at the diagram will show that the apparatus employed is very similar to that used for the ordinary manufacture of coal gas. The only differences, indeed, so far as the plant is concerned, are that the retorts are much larger than those used in the case of coal gas, that they are made of cast iron instead of fire-clay, and that they are provided with valves and pipes for the admission of the oil; while, with regard to the arrangement of the apparatus, it differs merely in this, that each part in succession is placed above the other, in order that the fresh oil introduced at the top of the scrubber, together with the condensed products, may flow continually downwards until they reach the retorts. When we bear in mind what Mr. Young has said respecting the action of heat on hydrocarbon vapours, when it is communicated to them by direct contact on the one hand and by radiation on the other, it is evident that, in order to produce gas economically from oil such as is being used at Galashiels, the retort must be of such a form as to give the greatest amount of internal space with the least amount of surface. Now, the only convenient form of retort that approaches to this condition is that of a cylinder; for the surface of a cylinder is directly proportional to its diameter, while its capacity is proportional to the square of its diameter. From this, it also follows that the greater the diameter of the retort, the



THE PEEBLES PATENT OIL-GAS PLANT AT THE GALASHIELS GAS-WORKS.



A Coal-gas retorts. B Oil-gas retorts. C Waste heat ports from coal-retorts. D Stand-pipe and dip-pipe. E Hydraulic main. F Compensating and settling tank. G Oil outlet from hydraulic main. H Main oil feeding-pipe. K Regulating-valve and syphon-pipe. L Fresh oil supply-pipe and ball-cock. M Horizontal condenser. N Oil-gas scrubber. O Oil-supply tank for scrubber. P Outlet of Scrubber to oil-gas meter.

smaller will be the surface exposed compared with the internal space. Besides, it is obvious that a retort of cylindrical form offers certain advantages—being easier made, and being readily turned in its place should it become bulged or cracked by the action of the heat. Accordingly, the retorts shown on the diagram are cylindrical in form, and are as large as the size of the ovens would admit. They are 27 inches in internal diameter and 9 feet long; and, as you will observe, they are laid with a downward inclination equal to about half their diameter. You will further notice that they are placed back to back with an ordinary setting of coal-gas retorts, the products of combustion from the semi-producer of which, after heating the coal-gas retorts, are employed to heat the iron retorts, being sufficient to maintain the low temperature necessary for the decomposition of the oil. Attached to the front of each oil retort is a mouthpiece, provided with a circular door and an off-take pipe. The latter is joined to the hydraulic main in the usual manner, by means of ascension, horizontal, and dip pipes. From the end of the hydraulic main, the horizontal condenser is carried with a slight inclination upwards, until it joins the bottom of the scrubber. The scrubber, which is one of the type originally designed by Mr. Young, and with which most of the members are acquainted, contains four trays, each of which is provided with the usual tubular openings and inverted tin covers. On the top of the scrubber is placed a cistern, for the purpose of containing the oil needed for scrubbing the gas.

In the working of the process, the temperature to which the retorts are heated necessarily depends on the nature of the oil that is being decomposed; but in every case it is considerably lower than that which has hitherto been employed when oil was gasified at one operation. For instance, with ·885 "blue oil," which is being used at Galashiels, and has also been largely employed at Peebles, the most suitable temperature on the outside of the retort, with the retort producing an average quantity of gas, was found to range from 1200° to 1300° Fahr.; while the internal temperature, at a point in the centre of the retort 4 feet distant from the mouthpiece, was from 900° to 950° Fahr.* With blast-furnace oil and coal tar, the temperatures are considerably higher. When the retort is in operation, the internal temperature is regulated by the rate of the flow of oil into the retort, and with each particular oil it varies within a narrow range; but the external temperature may vary through a wide range, according to the amount of work being done, or, in other words, to the make of gas per unit of time.

The retorts having been heated to the desired temperature, and the scrubber, the hydraulic main, and the rest of the apparatus been charged with oil, the oil is turned on at the regulating-valve K, and allowed to flow by the syphon-pipe into the stand-pipe D; and thence along the inclined bottom of the retort. Now, if what was stated in the previous paper regarding the complex mixtures of the oils used and the varying boiling-points of their different constituents be kept in mind, it will at once be evident that, as the oil flows down the inclined retort, these constituents are volatilized in the order of their boiling-points at distances further and further

* These temperatures were determined by Siemens's copper ball pyrometer. In the case of the internal temperature, the copper ball was introduced by means of a tube fixed in the retort-lid.

from the mouthpiece, and that thus the vapours into which they are successively converted are subjected to increasingly higher temperatures for gradually longer periods of time. The rate at which the oil is allowed to flow into the retort depends, in a great measure, on the nature of the oil that is being decomposed—being greater in proportion to the percentage of carbon that requires to be eliminated; but the oil must flow at such a rate that only a part of it is converted into permanent gas at a time, while the remainder, being but partially decomposed, leaves the retort in the form of vapour. The exact rate of flow, however, is readily ascertained by the appearance of the partially decomposed vapours, when a portion of the same is allowed to escape through a small stopcock fixed on the retort-lid. These vapours, when in their normal condition, should be of a pale yellow or straw colour; but, if the feed of oil be too small in relation to the temperature of the retort, the escaping vapours are more or less brown in colour, owing to their being over-decomposed and loaded with sooty carbon—which, of course, is detrimental to the process, and would probably lead to choking of the apparatus. In practice, however, the appearance of the condensed oil when returning to the retorts, and the condition of the interior of the retorts when they are opened for removal of the coke, are sufficient indications to guide the workmen in regulating the flow of oil.

When the gaseous products leave the retort, they are met in the stand-pipe by the inflowing oil, and are practically freed from any sooty carbon they may carry in suspension. They are next washed, while bubbling through the oil in the hydraulic main; and there the least volatile portion of the partially decomposed vapours is condensed. The remaining products then pass on to the condenser and scrubber, where, by gradual cooling and washing, the most volatile but still condensable vapours are removed; and finally the remaining gas leaves the scrubber by the outlet-pipe P in a thoroughly permanent condition. From the scrubber, the gas passes through a small station meter, after which it is mixed with the low quality coal gas at the inlet of the purifiers. During the whole operation of cooling and scrubbing the products from the retorts, the partially decomposed vapours are being gradually condensed—the least volatile first, the most volatile last; and as they become liquid, they return in an opposite direction to the hydraulic main, whence they pass by the pipe G to the compensating and settling tank F. In this tank any solid carbonaceous matter in the oil which would tend to choke the regulating-valve K is allowed to settle; and, when necessary, it may be drawn off by a stopcock at the bottom of the tank. A supply of fresh oil equivalent to that which is being permanently gasified is automatically admitted to this tank, by means of the supply-pipe and ball-cock L; and this fresh supply, together with the condensed oil, flows through the main feeding-pipe H to the regulating-valve K, by which it is fed into the retort.

In this manner, the oil which is introduced into the apparatus, after serving as a washing agent to remove the condensable matter from the outflowing gas, finds its way into the retort, where, by the action of the heat, it is partially decomposed in the fractional manner described; and the resulting products, as they pass upwards through the apparatus, are simultaneously subjected to gradual cooling and condensing, and to the washing action of the down-flowing oil. By this means the permanently gaseous part only of the products, which has withstood the action of the final washing with the fresh oil that is periodically pumped into the scrubber, is allowed to pass away; while the condensable part is returned to the retort, and is again and again subjected to this process of alternate decomposition and condensation and scrubbing, with the result that the original oil is completely split up into permanently gaseous compounds and solid carbon, the latter of which is left in the retort in a hard and dry condition.

The working of this process is remarkably simple, and is so far automatic in its operation that very little labour is required. In the case of the Galashiels plant, the heating of the retorts is, as I said before, done entirely by the low heat from the coal-gas setting; and there is thus practically no labour required in the heating of the oil-gas retorts. In other respects, also, the works at Galashiels are well situated for carrying out the process. The oil is delivered in tank-waggons on a high-level railway, and flows by gravitation into store-tanks. From these, it flows, also by gravitation, into the compensating tank, whence it is fed into the retort. The only oil, indeed, that has to be pumped is that which is needed for washing the gas in the scrubber. Altogether, very little labour is required; all that is necessary, besides that already stated, being a little attention to the regulating of the flow of oil into the retorts, and the withdrawing of the coke as it accumulates. Of course, more labour may be needed in some works than in others; but in all it will be exceedingly little, and very much less than that required for the manufacture of coal gas.

The plant having been described, and the working of the process having been explained, the members will now be desirous of gaining some information regarding the practical results of the process. Accordingly, I would ask their attention to this table, in which are summarized the results obtained from the decomposition of various oils differing in specific gravity and constitution:—

Name of Oil.	Specific Gravity.	Yield of Gas.		Illuminating Value.			Yield of Coke.	
		Cub. Ft. Per Gallon.	Cub. Ft. Per Ton.	As an Enriching Agent, Candles per 5 Cub. Ft.	Candles per Gallon.	Sperm Value, Pounds per Ton.	Pounds per Gallon.	Cwt. per Ton.
Blue oil	·885	85	21,505	90·0	1530	6635	2·52	5·70
do. do.	·845	86	22,790	93·8	1613	7329	2·09	4·94
Crude shale oil	·867	86	22,188	91·5	1573	6959	2·31	5·32
Blast-furnace oil	·966	95	21,945	60·5	1149	4552	4·00	8·25
Splint coal tar	1·150	79	15,800	25·2	398	1365	7·62	13·61

With reference to the gases obtained from the "blue oils" and the crude shale oil, they are, as will be seen, exceedingly high in quality, and have a specific gravity of about 970 (air being 1000). They require very little purification, as they contain only a trace of sulphuretted hydrogen. Further, the coke from these oils is of a hard, dense nature, is very free from sulphur, and contains only 0·3 per cent. of ash; and it is therefore very valuable.

The results which are given for blast-furnace oil are the average results obtained from the working of it at Peebles for over two months, during which time it alone has been used for enriching purposes. In decomposing this oil, no difficulty whatever has been experienced; but a higher temperature is necessary, compared with that employed in the case of "blue oil." The gas which it yields is also very free from impurities; but it contains about 13 per cent. of carbonic oxide resulting from the decomposition of the hydrocarbon compounds containing oxygen. The coke, although scarcely so dense as that from "blue oil," is likewise of considerable value.

In dealing with coal tar, the existing fire-clay coal-gas retorts at Peebles have been modified so as to adapt them to the principles of the process. They also are laid with an inclination downwards; and the tar is admitted to the standpipe by a regulating-cock and syphon-pipe. It is run into the empty retorts at such a rate that the internal temperature is considerably reduced, and that only a small portion is converted into permanent gas—the remainder, after condensation, being returned along with the newly-made tar again and again to the retorts, until the whole is finally converted into gas and coke. None of the difficulties hitherto met with when gasifying tar—such as choked pipes, &c.—have been experienced by this process; and the condensed tar in circulation, so far from becoming pitchy, actually becomes more and more liquid. A sample drawn from this tar in circulation yielded when distilled 10 per cent. of light oil, boiling under 400° Fahr.; while the original tar contained only from 3 to 4 per cent. of such oil. The gas produced from splint coal tar contains 10 per cent. of carbonic oxide, and about 1½ per cent. of carbonic acid and sulphuretted hydrogen combined. The coke—a large quantity of which is produced—is easily withdrawn from the retort, and is also valuable as a fuel. The results in the table are the average results obtained from the gasification of the whole of the tar made from splint coal at Peebles during the past two months.

In coming to the question of the relative costs of enriching coal gas by means of liquid hydrocarbons and cannel coal or shale, there are so many modifying circumstances to be taken into consideration—such as the cost of crude materials together with their carriage, the price of labour, the quantity and the quality of the gas, and the like—that it is impossible to give a detailed statement. But the results given in the foregoing table will enable each member for himself, after considering his own surroundings, to estimate the value of the process for his particular works. And, besides, the members, I have no doubt, are all familiar with the comparative statement of costs contained in the "Report on the Manufacture of Gas from Oil," by Mr. Linton, of Leith, which has appeared in the pages of our technical journals.

One thing I may say, before concluding, and that is that, whereas by all processes hitherto in operation only oils of a light and semi-refined nature could be used, by the Peebles process oils can be employed of whatever density and crudeness. This is no slight advantage; for while, in the one case, the supply of oil must be limited, in the other that supply is practically inexhaustible. When it is considered also that this matter of supply bears directly on the question of cheapness, it will be evident to every one, I think, that the

Peebles process is of considerable value, as it will at the very least enable gas manufacturers to hold the balance between the two commodities employed for the enrichment of gas—between cannel coal, on the one hand, and oil on the other.

[The report of the discussion on Messrs. Young and Bell's papers will be given next week.]

ADDENDUM TO MR. MACKAY'S PAPER (1892).

Mr. J. MACKAY read the following addition to his paper, read at the previous meeting, on

ENRICHING COAL GAS BY PARAFFIN OIL OR LIQUID HYDROCARBONS.*

When I prepared my paper last year on enriching coal gas by oil, I did not expect to have the pleasure of listening to the two very able and interesting communications just read by Messrs. Young and Bell. The process they have described differs entirely from the one adopted by me; and therefore I am not in any better position to discuss it than those who have given the matter only ordinary consideration. In my opinion, Messrs. Young and Bell have handled their subject in a very masterly and thorough manner, and deserve every success in their undertaking. As I mentioned last year, I was partially driven to the use of oil for enriching, and had to employ the materials which came readiest to hand. Were I again placed in similar circumstances, I should do exactly the same thing. The first cost is trifling. No alteration of plant is required, and no extra labour is involved. Notwithstanding this, I should not suppose for a moment that the process would compare economically with the very complete system which has just been described by Messrs. Young and Bell. Theirs has been carefully devised and thought out. Mine was rushed into; and unexpected results were obtained—results which, I hope, justified me in submitting my paper, as showing the possibilities of oil as an enricher. During last year, we succeeded in improving our working very considerably. In March, we made a working test of the oil, and obtained 25,500 cubic feet of 42-candle gas per ton. Formerly we obtained 17,000 cubic feet of gas, estimated at 50 candles. Everything depends upon how the oil is injected. The less injected into the retort at a time, the better is the result. With a decreased temperature in the retort, the percentage of tar rapidly rises. Careful working gives about 18 per cent. of a very thin tar, which mixes well with coal tar. Our refined tar was shipped to Germany in the usual course during the spring; and it gave unmixed satisfaction to the dealers there.

The Secretaryship of the Southend Gas Company.—We learn that this appointment, which became vacant a few weeks ago by the death of Mr. C. J. Dobson, has been conferred on Mr. J. T. Randall, son of Mr. J. Randall, Secretary of the Tottenham and Edmonton Gas Company, in whose office he has been for the past seven years.

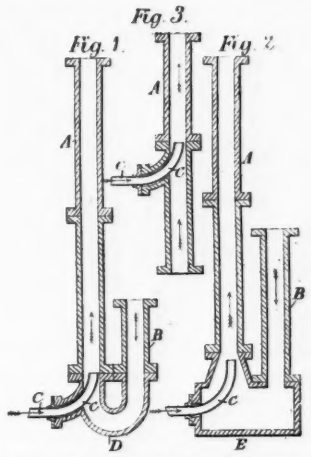
The Late Sir Thomas Martineau.—A special meeting of the Birmingham City Council was held last Thursday to receive from the Mayor (Mr. Alderman Lawley Parker) the official announcement of the death of Alderman Sir Thomas Martineau, as recorded in these columns last week. His Worship, in the course of his remarks, paid a graceful tribute to the personal qualities of Sir Thomas and to his devotion to public duties. In referring to his work in connection with the Water Committee, he remarked that the members of the Council knew that it was his doing that the great water scheme was brought before the consideration of the Council and the public, and that it was due largely to his ability that the scheme was passed through the Council and the Houses of Parliament. He thought they might consider that the obtaining of the Act of Parliament was the crowning triumph of Alderman Martineau's life. As Mayor of the city, he had been very constantly in communication with him; and he was greatly struck, during the year 1892, by the conspicuous ability and zeal, and above all his discretion, in carrying through that immense undertaking. He, like other of his friends who came most in contact with him, was sorry to see in that year the indications of failing health and strength; and after Sir Thomas had succeeded in securing the Act, a less conscientious and zealous man might fairly have claimed that reduced strength would have been justification enough for him to have sought to take a less active part in continuing that work. But they found his interest and his zeal, as far as his strength would permit, as great as ever. It was very sad for them all to feel he was not with them to carry on the scheme he took so great an interest in; but they should never forget it was due to him that the necessary powers were obtained. In his opinion, and he believed in the opinion of almost every member of the Council, it was the most beneficent scheme that was ever started by the City Council of Birmingham; and the name of Alderman Sir Thomas Martineau would always be associated with it. It may be here mentioned that the general opinion among the members of the City Council is that Alderman Lawley Parker, on retiring from the office of Mayor in November next, should be chosen Chairman of the Water Committee, in succession to the late Sir T. Martineau.

* See JOURNAL, Vol. LX., p. 250.

REGISTER OF PATENTS.

Relieving Back-Pressure on Gas-Engines.—Paton, A., of Leeds. No. 17,732; Oct. 15, 1892.

This invention relates to relieving the back-pressure on gas-engines which drive the exhaust up long pipes, by the application of a balance-pipe to the exhaust-pipe—that is to say, two pipes of preferably varying lengths are used (larger than the exhaust-pipe), and communicating at the bottom, and open at their opposite ends to the atmosphere. Then the engine exhaust-pipe is introduced into, and carried a short distance up, the first of these two pipes; so that, when the exhaust is driven into the first pipe, the balance is disturbed, and the air rushes from the second pipe into the first to keep up the balance The result is that the engine is relieved of the back-pressure almost as if the exhaust was discharged into the open air. Another means of obtaining the same result is to introduce the engine exhaust half-way up a long pipe, with the bottom end of the larger pipe open to the atmosphere.



Figs. 1 and 2 show the exhaust-pipe of the engine introduced at or near the bottom or base. Fig. 3 shows the exhaust-pipe introduced at a distance from the base or bottom of the relieving apparatus.

A and B are two pipes of a larger diameter than the exhaust-pipe C of the engine. They may be made of the same or varying lengths. In the drawings, they are shown of different lengths—that is to say, the pipe B is shorter than A; but the length of B may be varied as circumstances require. The ends of both pipes are open to the atmosphere, on opposite sides of the exhaust-pipe C. The pipes A and B may be connected together, so as to permit of there being a distinct division between the two pipes for some distance below the up-turned end of the exhaust-pipe—such, for instance, as the U connection shown at D (fig. 1), in which the bend of the connection is carried below the exhaust-pipe; or the box-like connection shown at E (fig. 2), where the connection with the pipe A is above that of B, and the connection with the latter pipe is below the exhaust-pipe. Provision is made in the connection D or E for introducing the exhaust-pipe C of the engine into such connection, and then turning its inner end upwards into the pipe A; or the exhaust-pipe C may be introduced at any suitable point—say, about half-way up—into the pipe A, and the end turned upwards, as at fig. 3. In this case, the lower portion of A is open to the atmosphere; thus dispensing with the pipe B.

When the exhaust from the engine is driven through the pipe C into the pipe A, the balance is disturbed, which causes the air to rush down the second pipe B through the connection D or E into the pipe A; or when the relieving apparatus is arranged as in fig. 3, it rushes directly into the pipe A to keep up the balance. The result is that the exhaust is driven up the pipe A; and the engine is thereby relieved of back-pressure as effectually, or nearly so, as if the exhaust was discharged directly into the open air.

Manufacture of Gas.—Ritchie, W. F.; communicated from J. B. Archer, of Washington, U.S.A. No. 6142; March 22, 1893.

This invention relates to the manufacture of gas by "the inter-decomposition of oil and water," and in which the gaseous products in a measure result from "the interaction of steam and carbon."

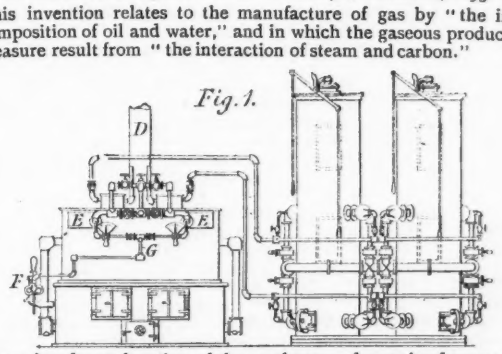


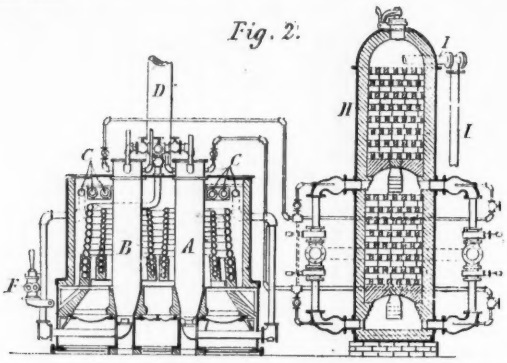
Fig. 1 is a front elevation of the producer and a pair of converters; showing the connections from one to the other. Fig. 2 [next page] is a vertical sectional view of the producer and one converter, connected together in operative position.

The producer (in plan view) is oblong, rounded at the ends; and it consists of an outer metal casing and an inner wall or lining of fire-brick. The lower portion of the producer, in which is situated the fire-box, is somewhat larger than the upper part; and on the interior

of the metal casing of this lower part are secured brackets to support the fire-brick, grate-bars, and superheating coils. Upon the lower set of brackets rests a support for one end of the grate-bars; their opposite ends being supported upon annular rings formed round the upper ends of hollow supports. The wall of fire-brick which encloses the fire-box is inwardly inclined, so as to form an annular fire-box; and the brackets which support the upper wall of fire-brick are arranged in an air-space extending inwardly to the fire-box—their inner ends supporting superheating coils, as hereafter described.

The superheating pipes are arranged in three coils, one of which ("the outside coil") extends around just inside of the fire-brick wall, but out of contact therewith; and its lower coils are enclosed in a casting of iron or steel, to protect them from the intense heat of the fire. This casting has a number of lugs extending inwardly from its lower edge, to support the inner coils, which are formed of smaller pipe than the outside coil, and also have their lower turns protected by metallic castings which rest upon lugs. By reference to fig. 2, it will be seen that one of the inner coils is arranged in each end of the outside coil.

Fig. 2.



A and B are two vertical cylindrical retorts, passing centrally through the inner coils, and being supported at their lower ends upon hollow standards. The lower ends of these retorts, where they enter the fire-box, are slightly tapered, and enclosed in casings of refractory metal, to protect them from the intense heat of the surrounding fire. Within the upper portion of the producer—extended transversely across each end thereof above the superheating coils—are three larger pipes, in which the oil is vaporized and mixed with the superheated steam from the coils. These vaporizers are connected in continuous series, by means of chambers at their rear ends, and the chamber connecting the pipes at their front ends; so that the steam and oil entering the pipes at their front ends will be caused to traverse the entire length of the three pipes before passing out at the rear.

In operation, the heated products of combustion pass up around the retorts and superheating coils, entering the space outside of the coil through the vents in the brickwork; passing up through the producer; and finally out of the smoke-stack D. The steam (coming from any suitable boiler) enters a pipe provided with a hair-valve for controlling the quantity of steam admitted; and, passing downwards, it enters the lower pipe of the outside coil. After circulating upward through this coil, the steam is conducted to the lower convolutions of the coils; and, passing upward through them, it is conducted to the injectors E at the front ends of the vaporizing-pipes C, where it meets the oil.

F is an oil-pump of any suitable construction, by which the oil is forced to the T coupling G, where it divides—part passing to one injector and part to the other. The pipes are each provided with a cut-off valve and a hair-valve, having a pointer and scale, to control the amount of oil fed to each vaporizer. The oil passing through the injectors is immediately vaporized by the intense heat, and mixes with the superheated steam in the pipe; and this mixture of steam and vapour of oil passes through the pipes C, from the last of which it is conducted to the lower ends of the vertical retorts A B, which serve as reservoirs in which the vapours receive their final heating, and from which they are fed to the converters. The series of pipes to effect this branch out from the upper ends of the vertical retorts; and there may be any number of them to convey vapour to a number of converters at the same time.

The converter H (fig. 2) consists of a vertical cylinder, lined throughout with a wall of fire-brick. A combustion chamber is formed at the bottom; and a mixing chamber about midway of its height, which latter divides the converter into two parts. Above each of the chambers is secured a spider in the form of an arch, the under sides of which are arched over the chambers; and each of these spiders supports a checker-work of fire-brick and iron. The fire-brick and iron may be built up of alternate layers of bricks and blocks or bars of iron, laid so as to leave spaces between them for the passage of the vapour; or they may be entirely of bricks constructed of fire-clay and bits of iron or iron filings. Four inlet-openings are formed through the walls of the converter, two into each of the chambers at diametrically opposite points. Into the two inlet-openings which lead into the lower or combustion chamber are fitted two pipes; and similarly there are two pipes into the upper or mixing chamber. All four pipes are provided with enlarged mixing chambers, into which enter the pipes which are connected with one of the vertical retorts of the producer, and with the other vertical retort. These pipes are provided with suitable valves, by means of which the vapour from the retorts may be admitted to the converter or shut off at will. The inlet-pipes are connected by pipes with a large pipe, leading from a suitable blower or air reservoir (not shown). The top of the converter may be made flat as in fig. 1, or round as in fig. 2. A vent opening is formed in the top of the converter, closed by a valve secured to a rock-shaft, so that it may be opened or closed at will by simply turning the shaft by any suitable means. An outlet-pipe I for the gas is inserted at the top of the converter, and leads to an ordinary drip or cooling chamber, not shown in the drawings.

The operation of the invention is as follows: The fire having been started in the producer, steam is admitted and passed through the superheating coils; and then to the pipes C, where it meets the oil. The oil is vaporized as soon as it enters, and the vapour mixes with the steam; the mixture being superheated in the pipes, so as to form a fuel or heating gas, and finally it passes into the retorts A B. The gas from one of the retorts (say, A) is admitted to the air-mixing chambers, and passes into the combustion chamber of the converter, where it is ignited. The heat from the burning gas passes through the checker-work of the converter, and makes it very hot; the products of combustion passing off through the open vents. When the checker-work is sufficiently hot, the air is turned off, the vent closed, and the amount of oil entering the retort A is greatly reduced by turning the hair-valve in the pipe. This forms a mixture in the retort which is very low in carbon; and when this gas passes through the highly-heated checker-work, some of the oxygen of the steam seizes the carbon from the oil, and some of the oxygen combines with the highly-heated iron in the checker-work, and with any particles of carbon that may be deposited on the checker-work during the previous combustion, and hydrogen is liberated. When the mixed hydrogen and hydrocarbon gases reach the mixing chamber, they meet a mixture of gas from the other retort B, which is much higher in carbon; and these gases unite to form an illuminating gas, which passes off through the pipe I. Moreover, the passage of the gas over the iron reduces the sulphides and phosphides of hydrogen to ferrous sulphides and phosphides, and so purifies the gas. The gas is fixed in its passage by the high heat of the checker-work; and it may be afterwards cooled and scrubbed in the ordinary way.

APPLICATIONS FOR LETTERS PATENT.

13,929.—Muller, A., "Valve for gases and liquids under high pressure." July 18.

13,943.—Collins, B. A., "Water-meters." July 18.

13,994.—Crossley, F. W., and Bradley, H. W., "Gas motor engines." July 19.

14,078.—Schwab, M., "Dealing with noxious liquid produced in the manufacture of sulphate of ammonia, and apparatus for that purpose." July 20.

14,105.—Eckstein, A., and Coates, H. J., "Illumination in connection with electric gas lighters." July 21.

14,175.—Clerk, D., and Lanchester, F. W., "Gas, petroleum, and like engines." July 22.

14,212.—Smethurst, W., Vickers, W. E., and Rogers, G. R., "Applying combustible mixtures of air and gas or inflammable vapour to driving motive-power engines." July 22.

14,232.—Crossley, F. W., and Bradley, H. W., "Gas or internal combustion engines." July 24.

14,344.—Kegler, D., "Gas-fired furnaces." July 25.

14,454.—Bickerton, H. N., "Starting apparatus for gas-engines." July 27.

14,522.—Farinetti, A., and Parietti, A., "Producing air gas from liquid hydrocarbons." July 28.

14,545.—Smith, J., "Production of illuminating gas." July 28.

14,558.—Hornsby, W., and Edwards, R., "Engines operated by the explosion of mixtures of combustible vapour or gas and air." July 28.

14,586.—M'Dougall, A., "Covering lead surfaces to protect water and other portable liquids from contamination with lead dissolved in contact therewith." July 29.

The New Gasholder for Leeds.—The large gasholder, which Messrs. Clayton, Son, and Co., of Hunslet, are erecting for the Leeds Corporation, is nearing completion; and it is expected that it will be ready for use by the end of November. The capacity will be between 5 and 6 million cubic feet; so that the structure will be one of the largest of its kind in the North of England.

New Joint Stock Companies.—The following joint stock companies have lately been registered: Frank W. Clark and Co., Limited, with a capital of £10,000 in £1 shares, to enter into an agreement with Mr. Frank W. Clark for the acquisition of a patent relating to the distillation and breaking up of liquid hydrocarbons. Fowey Gas Company, Limited, with a capital of £5000, in £5 shares.

The Kirkleatham Water Arbitration Award.—In the House of Lords on Monday of last week, the case of *The Kirkleatham Local Board v. The Stockton and Middlesbrough Water Board* was argued before the Lord Chancellor and Lords Watson and Macnaghten. Sir Richard Webster, Q.C., Mr. Balfour Browne, Q.C., Mr. Scott Fox, and Mr. Claude Baggallay appeared for the appellants; and the respondents were represented by Mr. Finlay, Q.C., and Mr. J. G. Wood. As our readers are aware, this was an appeal against an order of the Court of Appeal, dismissing with costs an appeal of the appellants from an order of the Queen's Bench Division, declaring that the Arbitrator was wrong in adopting the basis of calculation decided upon by him in making his award for the sum of £25,424, and that the basis of calculation contended for by the respondents should have been adopted by the Arbitrator, and declaring that the award ought accordingly to stand for the sum of £8006. Their Lordships, without calling upon the respondents, gave judgment. The Lord Chancellor said he was unable to entertain any doubt that the judgment of the Court below was right; and Lords Watson and Macnaghten expressed their concurrence. The judgment of the Court below was therefore affirmed; and the appeal dismissed, with costs. Consequent upon this decision, Mr. Haldane announced, in the Chancery Division of the High Court of Justice last Friday, before Mr. Justice Romer, that the parties had agreed upon an order to the effect that, on payment by the Local Board, on the 14th inst., of the amount of the purchase-money (£8006), the defendants should give them possession of the water mains, pipes, &c., the subject of the action; the defendants to pay the plaintiffs £100 for their costs. His Lordship then directed the case to be struck out of the list.

CORRESPONDENCE.

[*We are not responsible for the opinions expressed by our correspondents.*]

Ordinary v. Producer Gas for Generating Electric Light.

SIR,—As you have referred to me in the "Electric Lighting Memoranda" in the JOURNAL for the 1st inst., when discussing the question of the relative advantages of ordinary and Dowson gas for the production of electric light, I would wish to make a few remarks on the subject.

Where ordinary gas cannot be procured, of course the opportunity of selecting does not arise. But when town gas can be bought at a low price, I believe it will in most cases be found the more economical of the two; and I would wish to point out the essential economical differences between the two agents.

(1) If employing Dowson gas, a larger engine will be needed for the same output of work.

(2) A separate system of mains will be required.

(3) The area of the mains (even if a separate main were laid for ordinary gas) should be much larger, for two reasons: (*a*) the lower heating power of the producer gas; (*b*) the higher specific gravity. The first of these causes would require a ratio of 4 : 1, and the second probably a ratio of 3 : 2; or a compound ratio of 6 : 1. That is to say, that a main to deliver a given quantity of fuel gas should be six times as large in area—the difference of pressure in both mains being equal.

(4) I believe that the duration of mains carrying imperfectly purified gas would be much greater than that of mains filled with thoroughly purified town gas containing no free oxygen. For example, it is found that meters passing ordinary atmospheric air deteriorate much more rapidly than those measuring gas; and if meters were to be employed for measuring furnace gas, I believe a similar result would follow. Of course, the same observation would apply to gasholders, service-pipes, main-cocks, &c. In making this objection, however, I give it only as an opinion, as I have no experience in the matter.

(5) If furnace gas were to be stored, the holder room should be four times as large as that necessary for ordinary gas, or, if there were no storeage power, the producing plant should be made (say) four times larger, while some heat should be maintained in the intervals of rest.

(6) The production of furnace gas requires considerable attendance in stoking the boiler, feeding the generator, regulating the proper supplies of steam and air, clinkering two furnaces, the bringing in of coal, and the removal of cinders and ashes.

(7) There is some consumption, although small, of water.

(8) There is a liability to breakdown in the producing plant, and occasional suspension for repairs; and the quality of the gas must be subject to considerable variation.

(9) The wear and tear on the producer plant must be considerable; and a large percentage should be charged for interest and depreciation on the outlay.

(10) I would not restrict the use of gas-engines to so low a limit as 50-horse power. When gas is sold at a low price, this limit may at present be exceeded; and, if the use of separate mains for sub-stations be granted, gas of a lower illuminating, but high heating power might be supplied at a very low rate, considering that no outlay on services, meters, main-cocks, &c., would be incurred.

(11) The Morecambe case shows that neighbours may complain of a nuisance arising from the generator, as distinguished from the motor plant.

Without wishing to depreciate the advantages of Dowson or other generator gas, I wish to call attention to the fact that there is much more than the cost of coal to be taken into account, if we institute a comparison between it and the gas ordinarily supplied to the public. With the latter, we have practically unlimited storeage of a pure, uniform, and more powerful agent, smaller engines, no wear and tear of productive plant, no labour, no chance of breakdown in the supply, no nuisance from carriage of coal or ashes for generating plant, in many cases no additional mains, and in every case smaller ones, and no capital, wear and tear, or depreciation to be paid for by the consumer beyond the selling price of gas in the place where the engine is fixed.

In the case of large powers, fuel gas has done much to fulfil the prophecy of Sir F. Bramwell, when he said that, in a future not far distant, the gas-engine would take the foremost place among thermal motors, and occupy the position which the steam-engine so long held without a competitor.

DENNY LANE.

Cork, Aug. 3, 1893.

The North British Association of Gas Managers and Coal Analyses.

SIR,—The report just issued by the Research Committee of the above Association, and reported in the last number of the JOURNAL, calls for a short practical analysis, like the coal with which it deals. While giving the Committee due credit for their efforts to remedy an apparent grievance, I am not at all agreed with them upon their findings and the remedy which they propose, inasmuch as they have completely ignored or overlooked the disturbing elements or causes of all their disappointment, to say nothing of the presumption on their part in defining to coalmasters how they must analyze the product of their mines. Had the recommendation of the Committee been addressed to gas managers generally, to be observed in testing samples of coal prior to purchase, it might have been useful to a few who might chance to lack experience in such matters; but to compel coalmasters to have their coals tested upon a basis which will reduce the results to correspond with the so-called practical results, or equal to the product of from 12 to 16 cwt. per ton of coal, or a deficiency of from 20 to 40 per cent., according to the showing of the Committee, is, to say the least of it, absurd. This, however, it appears is what is necessary to satisfy practical men.

But where is the coalmaster who is foolish enough to agree to such a proposition? Beyond this, however, I do not wish to vindicate the position of coalmasters; believing, as I do, that certain clauses in the report are well timed and to the point, and suggest vigilance on the part of gas managers in seeing that they really get what they bargain for. But they must determine this on the basis of their own practical observations, or on the lines defined by the Committee, if they choose; and thus Tom, Dick, and Harry will each get results according to the perfection of his manufacturing plant or the intelligence brought to bear upon the conduct of the experiments. Supposing all three were asked to issue a report upon the same coal, it requires no stretch of the imagination to forecast a difference between them of 20 to 40 per cent. in the results obtained. Whose test is then to be accepted as the correct one? This is exactly what would happen (as it is alleged does happen in the case of the analyses complained of, when compared with the large-scale test), and indeed must so happen, as long as such analyses are conducted upon the unscientific methods usually followed.

Let us consider for a moment what may occur in the conduct of an analysis of coal to produce such diversity of results and at the same time show the insufficiency of the remedy which has been proposed by the Research Committee. To begin with, the sample which the Committee recommend is one that shall be selected from not less than 5 tons; and, that there may be no mistake, care is to be exercised in having it all broken down before distilling any portion of it. All very good. But what if the 5 tons should have been taken from the upper or the lower portion of the seam only (as the miner may happen to work the coal, and fill it into the hutches), which may, and does in many cases, represent a difference up to 25 per cent. in value? In the face of this fact, and as the result of considerable experience, I have long since discarded the 5-ton sample by itself as utterly useless in giving a proper representation of the seam of coal for analytical purposes, and for accurate comparative results of one coal with another. My practice is to insist in every case upon getting a sample representing a full section of the seam, of whatever thickness this may be, and giving unmistakeable evidence of its being such, and in weight not less than 1½ to 2 cwt. This, after examination, is all broken together, and used in ¼-cwt. charges; thus forming a sample infinitely superior to a truck sample—a fact which no amount of argument could ever disprove. I am aware that it is not unusual for some analysts to employ 2 to 3 lb. charges in testing coal; but this I consider altogether unsatisfactory.

Then, as to the physical condition of the coal the Committee have nothing to say. This is a most serious omission, since, as I pointed out at last year's meeting, 20 per cent. of the deficiency complained of might easily be accounted for. Every per cent. of water contained in the coal at the time of carbonization will, within certain limits, affect the gaseous results to the extent of 4 per cent.; and, as some coals contain as much as 13 per cent. of water, how, I would ask, is it possible to obtain uniformity of results without first determining under what proportion of such total water the coal shall be tested—a point which, I need scarcely add, I most carefully observe in all analyses. Then, again, there are the mischievous consequences of carbonizing on the so-called practical scale, and employing temperatures altogether unsuited for coals of different qualities; to say nothing of defective or leaky retorts. The physical and chemical properties of the tar, which ought in every case to supply evidence of the sufficiency or insufficiency of the temperature employed, are entirely disregarded; and, as a consequence, the tar might, on account of defective temperature, be found to contain the equivalent of 1000, 2000, or more cubic feet of gas, and the reputation of the coal or the coalmaster be damaged to the extent of the deficiency.

Although what I have already pointed out is more than sufficient to account for the alleged 20 to 40 per cent. loss on the so-called practical scale, much more might be said regarding possible serious loss in the process of condensation. For instance, contact with tarry matter, and consequent loss of illuminating value; error in the measurement of the gas under pressure of the holders, and many other defects inherent in the large-scale test; the employment of burners totally unsuited for the quality of the gas to be tested, such as using the union jet, drilled at angles of 40° or 45°, to test a gas of 20 candles and under, and so obtaining a result of from 3 to 5 candles less than the actual illuminating power.

It will thus be evident that the sources of error in coal testing are manifold, and that, to conduct the same upon sound and scientific principles, long experience is necessary. Need I add that, as in the analysis of any other article in commerce, the weight of the products from a given quantity (say, a ton) must be accounted for approximately? This is a condition which I never neglect. It would, however, require a volume to fully elucidate the various points upon which I could dwell; but I must not further trespass upon your space. I trust what I have already said will be sufficient to convince any who may study the question, of the insufficiency of the rules proposed to meet the case, because of their vagueness and the uncertainty of uniform results under conditions so unstable, and so little under control, as in the case of the large-scale tests. I presume that what the coalmaster requires to know is what is actually in his coal; but he must necessarily leave it to his purchasers to take out of it what their apparatus and intelligence combined will enable them to do.

GEO. R. HISLOP.

Gas-Works, Paisley, Aug. 4, 1893.

Fuel Gas not Comparable with Coal Gas.

SIR,—I venture to agree with the main arguments you advance in the article in the JOURNAL for the 25th ult. on the above subject, in criticizing the proposal made by the *Electrical Review;* and I think it also more than likely that your electrical contemporary will see the point of the correction you made. But is there no other gas in existence equal, or very nearly so, to illuminating gas in calorific value, and capable of being manufactured on a large commercial scale, and which is good enough and well suited for being distributed through mains? I think there is, and it is coke-oven gas. This gas, however, has nothing to do with the so-called fuel gas companies. It is neither generator nor water gas, but a coal gas pure and simple as generally understood. The coke-oven system I have in my mind in making this statement, for producing this gas (the now well-known Simon-

Carvès construction) is a long and narrow closed vessel whereby the coal is converted into coke under exclusion of air, each oven holding from 5 to 6 tons of coal slack at a time. Therefore, the conditions being almost identical with those obtained in gas making by the ordinary gas-retort, the gas cannot help being of the same kind as that manufactured in ordinary gas-works. This gas, therefore, is about equal to ordinary illuminating gas in calorific value—viz., it contains from 650 to 700 heat-units per cubic foot; but, owing to conditions more favourable to manufacture on a large scale, &c., it could be sold at (say) even less than 7d. per 1000 cubic feet at a profit to the maker. My proposal to help your electrical contemporary over the difficulty pointed out by you would consist in erecting a coke-oven plant, with recovery of bye-products, on the Simon-Carvès principle, for instance, for the manufacture of gas required for driving his gas-engines. I do not advance the idea as new, but only call attention to it again, which, even at this advanced period of the nineteenth century, seems desirable in the interest of pushing the fuel question to a further stage of development, if possible.

My friend Mr. John Young, Superintendent of the Allegheny Heating Company, after an exhaustive inquiry into the merits of our coke-oven gas as a heating gas, delivered a valuable lecture a short time ago, before the Western University of Pennsylvania, on the subject of natural gas. Being in search of a substitute for the gradually failing sources of supply of this gas, Mr. Young comes to the conclusion that both producer and water gas are not at all suited for distribution; one of the practical reasons for such a conclusion being that the mains, meters, &c., would require to be of quite inordinate dimensions for conveying the gas in sufficient bulk for producing the same calorific effect as would ordinary illuminating or coke-oven gas.

The sustained successes achieved by the Simon-Carvès system of coking in this and other countries make it quite clear and beyond doubt that gas, coke, tar, ammonia, benzol, &c., can be produced in such a way that the cost of labour is considerably reduced, and a coke produced which commands a more extensive market and a better price than does ordinary gas coke. And the gas of the quality mentioned can be sold cheaply enough to the consumer for both heating and power purposes. A slight modification in the construction of the ovens in question will yield an abundant supply of gas for distribution, besides the requirements in gaseous fuel for the ovens themselves; and neither the coke nor the residuals would suffer in the least, or be deteriorated thereby. In the event of the erection of an installation on the lines herein advocated, the policy would be to sell such coke-oven gas at the lowest possible figure, and depend largely for revenue on the other products of the coal—viz., metallurgic coke (or, for the matter of that, if desired, any other class of coke at will), tar, ammonia, benzol, &c.; and thus assuring a reasonable return on the capital invested.

Technically, and from the engineering standpoint, all this is comparatively easy of accomplishment; and an inquiry into the now somewhat extended application of the Simon-Carvès coking system would soon be found to prove what I say to be a true statement of what might reasonably be expected, and that also when looking at the commercial side of the question. I am convinced that, in many instances where cooking, heating, and power gas is required, the best and cheapest gas would be that made by the Simon-Carvès coke-ovens. They might be erected (say) in the vicinity of large towns—of course, at a proper distance from such localities as those to which the *Electrical Review* refers, and from which source it anticipates such notable advantages to the further spread of the electric light by the installation of gas power for central station electric lighting. It is certain that producer and water gas cannot successfully compete for this purpose; or, in the language of the general conclusions of Mr. Young's lecture (as cited above), "he does not see that any system that depends for revenue on gas alone can be a success commercially." As a helpmate for remedying the smoke nuisance in large towns, I can see clearly that the coke-oven bids fair to be accepted as a serious candidate by people of wealth and enterprise, with a view to earning good dividends.

W. SCHROLLER, M.Inst.M.E., Resident Engineer,
Durham Coke and Bye-Products Company, Limited.

Lanchester, near Durham, Aug. 2, 1893.

The Public Lighting Question at Grimsby.—After pursuing what is locally termed their "fatuous policy" in leaving the streets unlighted for the past two months, with a view of spiting the Gas Company, the Grimsby Corporation have had to give way; and the public lighting has been resumed in accordance with the terms of the tenders submitted to them—the price quoted by the Grimsby Gas Company being £2 12s. 6d. per lamp, and that by the Cleethorpes Gas Company (who light a small portion of the district) being £3 2s. 6d. The decision of the Corporation to dispense with the street lights was sharply criticized when it was arrived at; and their persistent adherence to it, notwithstanding the public inconvenience it caused, has not raised them in the opinion of the ratepayers. It is to be hoped that all the parties to the new arrangement will work amicably together.

The Price of Gas at Stockport.—The price and quality of the gas supplied in the borough formed the subject of a long discussion at the meeting of the Stockport Town Council on Wednesday last. Mr. G. Burrows moved an instruction to the Gas Committee to consider a reduction of the existing charge of 2s. 8d. per 1000 cubic feet, and said he made this motion in view of the favourable prices at which the Committee had placed their coal contracts. The Mayor (Mr. J. Turner) suggested that it would be very unwise to decrease the price during the present coal trouble; but the Town Clerk intimated that there was a clause in the contracts with reference to strikes. The Chairman of the Gas Committee (Mr. J. Noden), in opposing the motion, stated that there were in Lancashire 68 gas undertakings—38 owned by local authorities and 30 by private companies. The average price charged by the local authorities was 2s. 10d. per 1000 cubic feet for 18·57-candle power gas; and the companies charged 3s. 7d. per 1000 feet. The average price of the whole was 3s. 2d. for 18·29-candle gas, as compared with 2s. 8d. in Stockport for 19-candle gas. It was ultimately decided that no change should be made.

PARLIAMENTARY INTELLIGENCE.

HOUSE OF LORDS.

The following progress was made with Bills last week:—

Bill read the first and the second time and reported: Burghs Gas Supply (Scotland) Act, 1876, Amendment Bill.

Bills read the third time and passed: Leeds Corporation (Consolidation and Improvement) Bill; St. Helens Corporation Bill.

LEGAL INTELLIGENCE.

HIGH COURT OF JUSTICE—CHANCERY DIVISION.

Friday, Aug. 4.

(*Before Mr. Justice* KEKEWICH.)

Rothwell Local Board v. Wakefield Union.

Mr. WARMINGTON, Q.C., moved, on behalf of the plaintiffs in this case, for an injunction restraining the defendants from cutting off the supply of water to part of the district under the authority of the plaintiffs. Until 1891, the townships of Carlton and Lofthouse formed part of the defendants' Union; but under the 57th section of the Local Government Act, 1858, resolutions were passed and an order was made whereby these two towns were taken from the defendants' Union and attached to the plaintiffs' district. The defendants, up to the time of this order, had supplied from their works water for the whole of the district which was proposed to be annexed to the plaintiffs' original district, and were not willing, without a struggle, to allow these townships to be detached from them. Accordingly, as provided by the 57th section of the Act, a local inquiry was held on Dec. 29, 1892, when the order was confirmed. On Feb. 17, 1893, the first meeting of the Board of the extended district was held, and an arrangement was entered into with the defendants that they should continue the supply of water up to the 25th of March. In the following months of March, April, and May, a correspondence ensued between the parties, the result of which was, as the plaintiffs contended, that the defendants undertook to supply the plaintiffs indefinitely, subject to the defendants' right to discontinue the supply on giving three months' notice. On the 25th of May, the defendants gave such notice, which was subsequently waived. But it was renewed on the 27th of June; and the plaintiffs were invited to take the present proceedings.

Mr. EYRE, who appeared for the defendants, said their desire was to act properly in the matter; but they did not want it to go on indefinitely. The plaintiffs had had ample time to make the necessary arrangements for obtaining a supply of water.

After some discussion, it was arranged that the defendants should undertake not to cut off the supply of water to the plaintiffs before the 31st of December next.

WESTMINSTER COUNTY COURT.—Monday, July 31.

(*Before Mr.* LUMLEY SMITH, Q.C., *Judge.*)

London County Council v. Vestry of St. Luke's—The Repair of Fire Hydrants.

To-day, his Honour gave judgment in the above case, which came before him on the 10th ult. (see *ante*, p. 174). It was a test action brought by the London County Council to recover £1 4s. 3d. expended by them in the repair of two fire hydrants, for which it was alleged the defendants were liable under the provisions of the Water-Works Clauses Act, 1847.

His HONOUR, having recapitulated the facts of the case, and referred to the statutes bearing upon the proceedings, said the first point raised on behalf of the plaintiffs was in regard to the letter of demand; and it was contended that, in the absence of any reply to this letter, the defendants must be inferred to have undertaken to pay for the work if carried out by the plaintiffs. He thought the inference to be drawn from a letter that was not replied to must vary according to the circumstances of the case. He did not consider that, in this case, having regard to the statutory positions of the two public bodies with regard to repairs of roads and hydrants, any consent to pay by the defendants could be inferred. It had also been urged that this case was governed by the judgment of the Court of Appeal in the case of *Moore v. The Lambeth Water Company*,* and that Vestries are bound to keep their roads in a fit state for the public to pass along, having regard to the hydrants being lawfully placed there. That case might be in point if the London County Council had refused to alter their hydrants, and some passer-by had sustained injury, and was suing them or the Vestry for damages. It did not, however, appear to affect the present question between the Vestry and the Council; nor was it, he thought, an authority for the proposition put forward to the effect that, if there was in the road a hole resulting from non-repair, and a hydrant was placed there, the Vestry, having no power to raise the hydrant, were bound to keep the hole there. Lord Justice Lindley said it would seem that, in placing a hydrant, reasonable allowance should be made for unforeseen circumstances. In the present case, he (the Judge) was not satisfied that reasonable allowance had been made for a circumstance which should or might have been foreseen—viz., that the road must, sooner or later, be brought up to its proper level. The case cited above was decided on the assumption that the fire-plug was properly placed originally. In the present case, however, his opinion was that the hydrants were not so placed, but were put on a level which was temporarily, but not properly or permanently, the level of the footway. No question arose in the cited case as to the right of a Vestry to raise the level of the highways under section 98 of the Metropolis Management Act, 1855. It was very difficult to suppose that this power could be taken away simply because the London County Council had placed a hydrant at a

* See JOURNAL, Vol. XLVI., p. 921; and Vol. XLVII., p. 742.

fixed level. If put to expense, the Council would have such right to compensation as would be accorded, if any, to other interested parties. Upon the whole, he was of opinion that there was no agreement on the part of the defendants to pay for the work done. They had carefully performed their duty in having repaired the road; and it was equally clear that the Council's hydrants were placed at an improper level, and that the Vestry had no power or duty to raise them. In the absence of any written agreement on the part of the Vestry to pay the charge in question, there was nothing in the evidence which could make them liable. Judgment would therefore be for the defendants, with costs.

Leave to appeal was asked for, and granted; his Honour remarking that the case was a most important one.

The Leeds Corporation Gas Coal Contracts.—The Gas Committee of the Leeds Corporation last Tuesday considered the tenders for their coal supply during the ensuing twelve months; and they determined to enter into contracts for 265,000 tons. The prices to be paid for this large quantity range from 7s. to 12s. per ton; and, on the average, this is at least 1s. 3d. per ton less than the prices which had to be paid twelve months since. The contractors are about 24 in number; and their collieries are in Yorkshire and Derbyshire.

The Extension of the Llanelly Water-Works.—At the meeting of the Llanelly Local Board yesterday week, Mr. E. Trubshaw brought forward a motion pledging the Board to take steps to secure advantage of the Act of Parliament obtained for the purpose of constructing an additional reservoir for the town. The Act procured three years ago empowered the Board to borrow the money; and unless some move is made before next May, the Act will lapse, though it cost the town upwards of £500. Mr. Trubshaw proposed that the entire matter be referred to a Committee to take immediate action; and this was unanimously agreed to.

York New Water-Works Company.—The half-yearly meeting of this Company was held last Thursday. The accounts which were presented disclosed a substantial increase in the revenue, but an exceptional expenditure—due mainly to increased rates, the cost of transferring some newly purchased land, repairs to the railway siding at Acomb Landing, and drainage improvements at the Company's premises in Lendal. A sum of £200 was also debited against revenue as a fair proportion of the cost of repairing and raising the flood banks; and the Directors stated that they were of opinion that the works were now efficiently protected against future floods. The water-rents amounted to £8468. From the balance available for dividend (£6161), the Directors recommended dividends at the following rates per annum; 5 per cent. on the preference shares, 9 per cent. on the ordinary shares, and 6½ per cent. on the new shares. The report was adopted.

Action with regard to the Construction of a Gasholder Tank.—At the Liverpool Assizes last week, Mr. Justice Kennedy had before him a case, in which Messrs. Holme and King, contractors, of Liverpool, made a claim against the Stockport Corporation for "extras" in connection with the construction of a gasholder tank at their Portwood gas-works. The tank was commenced in 1889; and the contract price was £8726. After the completion of the work, Messrs. Holme and King put in a claim for about £2500 for "extras"—the greater part of this sum being for items which the Corporation disputed. The latter paid into Court £500 for items which they admitted; and they made a counter-claim for about £1700 against Messrs. Holme and King—the items covered by this including £1300 for delay in the completion of the contract (at the rate of £50 a week), and £300 for materials, &c., supplied by them to the contractors. On the case being called on, his Lordship made an order that the action should be referred to an Official Referee.

Weymouth Consumers' Gas Company.—The report on the working of this Company for the past half year shows that the business continues active and progressive; the gas-rental maintaining the regular, but small, increase which has been observable during the past few years. The Directors also state that coal has been bought at more favourable prices than those which have been recently ruling; but, on the other hand, coke has not found so ready a market, and has consequently been disposed of at much lower prices. The consumption of gas by private consumers and public lighting amounted to 23,700,900 cubic feet; and this produced £4705. The meter-rental came to £122; residual products realized £835; and for gas-fittings £160 was received. The total income was £5824. Deducting from this the expenditure (£3760), there remains a profit of £2064, which is of average amount. The balance of net profit standing at the net revenue account is £2925. From this the Directors recommend the declaration of a dividend, less income-tax, at the rate of 10 per cent. per annum on the ordinary "A" stock and 7 per cent. on the ordinary shares.

Chester United Gas Company.—The half-yearly general meeting of this Company was held last Thursday—F. L. Bagnall, Esq., J.P., the Chairman of the Company, presiding. The report presented by the Directors stated that, favourable contracts having been secured for the ensuing year, they had determined to reduce the price of gas supplied by meter 2d. per 1000 cubic feet; the reduction to date from the 1st ult. The discounts for prompt payment are to be continued. The Chairman, in moving the adoption of the report, mentioned that, with the reduction now made in the charges for gas, and the allowance of discount, no consumer in Chester need pay more than 3s. per 1000 cubic feet; large consumers getting it below this price. The monetary effect of the reduction was equal to £1300 a year. With respect to the strike of colliers, the Directors had taken such precautions as would, he hoped, enable the Company to continue the supply of gas through the strike without serious loss of revenue. The report was adopted. An interim dividend on the ordinary stocks of the Company at the statutory rates was then declared; and the meeting was brought to a close with a vote of thanks to the Chairman and Directors. The Company are about to increase their storeage; and, as already mentioned, Messrs. R. and J. Dempster have been entrusted with the erection of a three-lift gasholder on the Gadd and Mason columnless principle.

MISCELLANEOUS NEWS.

THE GASLIGHT AND COKE COMPANY.

The Half-Yearly General Meeting of this Company was held at the Chief Office, Horseferry Road, Westminster, on Friday last—Colonel W. T. MAKINS (the Governor) in the chair.

The SECRETARY and GENERAL MANAGER (Mr. J. W. Field) having read the notice convening the meeting, the report of the Directors and the statement of accounts for the half year ending June 30 last, given in the JOURNAL last week, were presented.

The GOVERNOR, in moving—"That the report and statement of accounts be received and adopted," said there were several matters of rather more than ordinary interest dealt with this half year, especially the question of revenue. Before he came to this, however, he would refer the shareholders, as usual, to the capital account, from which they would see that the amount expended during the six months ending in June had been £106,383. Of this amount, £8257 had been invested in land, which had been required principally for the purpose of adding to their coke and coal storeage. They had hitherto been very much cramped at two or three stations. With regard to the buildings and machinery, the expenditure in extensions of the works had been £89,640. These consisted of the new retort-house at Beckton, £28,500; amount spent on the pier and viaduct, £17,000; on gasholders and scrubbers, £23,300; and on sundry works at other stations, £20,840. This showed a small increase in the amount of capital per ton of coal for the half year, by reason principally of the reduced output. This was a matter which, of course, at first sight, was to be regretted; but he had very little doubt that it would soon right itself. Hitherto the diminution in the amount of capital per ton had been almost uniformly progressive. For the coming winter they would have a capacity of manufacturing power equal to 116 millions. This was the maximum production for one day; and it included a certain amount of oil gas at Beckton and Kensal Green. As regarded gasholder accommodation, they would have 92 per cent. of the maximum day's delivery, which was pretty nearly getting to what was considered the normally proper percentage—viz., 100. There was no doubt that having plenty of storeage reduced the cost of producing and sending out the gas. With regard to the revenue account and the expenditure upon coal, the price both of common and cannel coal had been less than in the corresponding period of 1892, to the extent of 1s. 5¾d. per ton on the quantity carbonized. This was exceedingly satisfactory; but he hoped that, during the present half year and in the half years to come, they might have a still better record with regard to the price of coal, because they had been fortunate enough to buy it at a considerably reduced cost. The wages were still paid at the same rate; and so long as the men continued to work as cordially and admirably as they had done during the past half year, the Directors would not seek to make any alteration by way of a reduction. At the same time, the lot of the gas stoker was gradually becoming better, and his work less onerous, by the introduction of labour-saving machinery; so that the old days of what was called the "brutal labour of gas stoking" were rapidly passing away. The wear and tear might appear to the shareholders to be somewhat high. The reason for this was that they had had an exceptional amount brought into the present half year, on account of the sheeting of a gasholder at Nine Elms, which they had allowed to go perhaps a little too long in consequence of the stress of circumstances in past years. One item of expenditure was extremely unsatisfactory—he referred to the very large increase in the rates and taxes. The Company were not alone in suffering in this way. Every railway company he knew of were suffering in the same way, and to a greater extent, particularly one with which he was connected. In the case of the railways, indeed, the system appeared to be this: Where the public wanted improved accommodation in the way of a better station, and great pressure was brought on the company to provide it, although it did not certainly—at any rate not at once—increase the traffic, yet when it was provided, the assessor came along and put up the rating on account of the new station, which had simply been erected for the benefit of the public. It did not matter very much to the company, however, because the public paid partly in rates and partly in railway fares; and, similarly, the consumers in this Company's district and in other districts paid partly in the price of their gas and partly in ready money to the collector. The shareholders would be surprised to know that the amount of taxation which the consumers paid through their gas bills was about 2¼d. per 1000 cubic feet on the gas sold. It was a matter which caused the Directors a certain amount of anxiety, because the rate of taxation seemed to be advancing "by leaps and bounds." In 1883, the rates paid by the Company only averaged 4s. 6d. in the pound; and the present year they averaged 5s. 8¾d.—being an increase of 1s. 2¾d. in ten years. This meant in money to the consumers, in the case of the Company, between £38,000 and £40,000 a year alone; and they hoped the parishes could give a good explanation of this increase in their expenditure. The law and parliamentary charges were not much higher; but he had been hoping that they would get considerably lower. The Company were, however, constantly being attacked; and they were therefore bound to take steps in defence. With respect to the present session, they had been able to defend themselves without any extravagant cost against the attacks of the London County Council regarding the subway and the betterment clauses in connection with gas and water mains. In fact, on every occasion in which they had appeared in Parliament they had obtained all, or almost all, they wanted. Perhaps in the case of the Electric Powers Committee they did not get quite so much as they would have liked; but in a Bill in the House of Lords, a clause had been put in which was to be embodied in every Tramway Bill, which went very far in the way of protecting gas and water mains from any injury by reason of these undertakings. He was sorry to say that £800 of the expenditure on parliamentary opposition had been caused by their old friend Mr. Preece, who had calmly proposed that the whole of the gas and water mains should be made available for the purposes of the return current of the tramway and other electrical power companies. At the close of the examination, Mr. Forwood put a very pertinent question to

Mr. Preece, who replied that "the alternating currents would not affect the gas and water pipes, but continuous currents would; though even in the case of continuous currents and of gas and water pipes the disturbing effect could be very much diminished by placing the whole of the gas system and the whole of the water system in direct communication with the return system of the railway. So that, even there, with proper supervision, the disturbance, whatever it might be, was remediable." As soon as he (Colonel Makins) read this, he thought it was time to stir; and they did so, with the result that this little scheme was blown into the air, and the Company obtained what they required. It was unpleasant to pay £800 for this, but they could not help it; and the Directors must refer the proprietors to Mr. Preece as the cause of it. The bad debts showed a rather considerable increase. He feared this was only due to bad trade in general. He had had some information sought for with respect to the cause of this in particular; and he had found that there was a very large additional number of consumers who had become bankrupt, or who had gone away and failed to pay during the past year. He trusted that with the return of prosperity—when it did return—they would get back to their normal rate of bad debts. The next question the Directors dealt with in the report was the important one of the quantity of gas sold; and he was sorry to say that this showed a decrease of 2·8 per cent. in the past half year, after allowing for the difference between that period and the corresponding period of 1892 through Leap Year. He did not think it was at all necessary that he should point out to anyone that we had been having a very fine summer—the sort of weather which was delightful to everyone except gas makers and farmers; and the drop in the sale of gas which he had mentioned was entirely due to the great difference in temperature and the amount of sunshine in the two periods compared. He might mention that the figures regarding the sunshine and the temperature were not the Company's, but the Royal Society's daily records; and therefore they were official. He thought a few shareholders were still of opinion that the competition of the electric light had something to do with the decrease; but, in order to dispel this illusion, if it did exist, he had had the figures which he gave them in 1891, as to the effect upon their revenue of the use of electric light in their district, brought down to the present date. He gave them some 83 consumers of all classes—public buildings, the Houses of Parliament, banks, railway companies, theatres, clubs, large houses of business, and even a few private consumers; and he showed them at that time that the effect of the introduction of the electric light on their quadrilateral of Bond Street, Regent Street, the Strand, Piccadilly, and Pall Mall had been very slight indeed. Small, however, as the effect was in 1891, in 1892 it had become "beautifully less;" for whereas between 1889 and 1891 their rental had decreased, by reason, as they supposed, of the introduction of the electric light (as he was only dealing with the consumers who used the electric light), from £91,363 to £87,847, in the present year to June 30 the £87,847 had not only gone back to the £91,363, but had become £99,902. Therefore, in spite of two years more of the electric burden, they were something like 10 per cent. better in the very district where the light had hitherto been used more than in any other place. It would not be fair to give them figures as regarded any private customers, whose privacy they respected; but he had been so much struck with the return, that he had classified it. This showed that whereas railway companies paid the Company in 1889, in the district mentioned, £16,600, in 1893 they paid them £24,724. As regarded the banks, they were practically the same—there being a small drop of £300. As to the hotels, there was a similar small decrease. When, however, they came to the great shops—such as Maple's and Whiteley's—the consumption had gone up from £13,474 in 1889 to £16,773 in 1893. These calculations were on the basis of the same price; and the changes to which he had called attention were not attributable to the increase in charge. Taking the railways, banks, hotels, clubs, and great shops, they had exactly the same result, because the consumption had gone up from £52,700 to £62,123 between 1889 and 1893. He thought they might therefore dismiss the electric bogie from their minds, until at all events there were some fresh developments. They were always hearing a great deal about its progress, especially from Mr. Preece, who, in controversy as regarded consumption, seemed to have introduced the principle of the American game of poker; and with respect to the electric light he was the champion "bluffer"—always exalting the light at the expense of gas. He (the Governor) might perhaps be excused for giving these figures, which he thought might be very comforting to Mr. Preece. He would also like to refer that gentleman, and also the shareholders, to the little pamphlet [of which copies were in the room] containing the Inaugural Address delivered by Mr. Denny Lane in June of this year at Belfast. It certainly was a most excellent comparison of the two systems of lighting. It was a good story, singularly well told; and he wished to say that, if any shareholder present would like another copy of it, or if any shareholder who read his remarks in the papers would like one, it should at once be forwarded to him if he would write to the Secretary. He thought every gas proprietor should read Mr. Lane's address. There was a small increase in the Company's meter-rental; but there was a figure in the capital account which they had not had before—a sum of £2230, which had been brought into account as representing meters returned from the district. The fact was that during the past half year they had had considerably more meters than usual returned into store; and the Directors had thought it only right that this fact should not be blinked, but that credit should be given for the value of these meters in the capital account. The figure, however, was not of much importance, because, although this large number had been returned, the number of lights and of consumers had augmented, as had the business generally. One of the most interesting features was the increase in the establishment of gas-engines. No fewer than 140 new gas-engines had been started in the past half year—bringing the number up to 2665; and he believed that in many instances these engines were used for driving dynamos. Therefore, if they had the competition of the electric light, they also had a little *solatium* in this respect. Another very good feature was the number of stoves; and they had sold in the past half year 885. This was one of the points which he always looked to with greater satisfaction than to any other, because it meant that their daily consumption was increasing, and that their customers were taking to the use of stoves—not merely trying them as an experiment, for when they had bought and paid for them they generally continued to use them. With respect to the question of small dwellings, there had been the substantial decrease of 87 during the past half year; and they had found that this class of business was not quite so profitable as they had hoped it would be. The question of using prepayment, or what were called "slot," meters arose in connection with this matter. They were getting all the information concerning these appliances that they could; and he had to thank his friend Mr. Livesey for very kindly writing him the result of the experience of the South Metropolitan Company, as far as it had gone. As soon as they could feel they were on sure ground, they proposed to make an experiment in the same way; but as far as they had got at present, they had not yet adopted this system. The price of their coke was low. They had hoped for better things in this direction; but a great deal depended on the state of trade. The tar and tar products were much better than they were in the previous half year, although not quite so good as in the corresponding period of 1892. Their sulphate, however, had reached a very high price now; and he hoped that during the current half year residuals would not cut a very bad figure—at least, not so bad as they had been accustomed to lately. With respect to the coal strike, which, no doubt, was very much in the minds of most people, he did not think it was likely to affect the Company seriously. They had a considerable stock on hand—300,000 tons—which was equal to eleven weeks' consumption; and, moreover, their supply came mainly from a district in which at present the men had not struck. He had read very carefully the remarks of Mr. Pickard and others who represented the Federated Miners' Union, and he had been very much struck by one argument which had been used, and which he thought ought not to pass unnoticed. Mr. Pickard had blamed the coalowners for not raising the price as against the gas and railway companies and others who, he said, could well afford to pay. This was a new doctrine in economics—that the power of the buyer to purchase should regulate the price of the article to be sold. But there was another view of the matter; and he would like to ask those who argued in the way Mr. Pickard did why the poor consumer in London should pay more for his gas, in order that the coalowner and the coalworker should divide more between themselves in the shape of profit and wages. The fact was that in this country trade was so interwoven that it was quite impossible to make a victim of any purchaser by raising the price against him for long. An attempt—he was sorry to say, a successful attempt—was made in this direction by the coal interests at the end of 1889. Previously their coal per ton had averaged about 12s. 3d., 12s. 1d., 11s. 9d., and figures like that; but in 1890, the price suddenly went up to 14s. 7d., and in 1891 to 16s. 4d. Happily, it had come down again, and had come back very nearly to the level of 1888, which ruled for so long a period. The higher figure he had mentioned was artificial; and, like all artificial prices, it could not exist long. If one had the trade in one's own hands, it would be possible, no doubt, by judicious arrangements, to keep up prices; but when big profits were made in this way, competition set in, and prices sooner or later reached their proper level, as regulated by the laws of supply and demand. He sincerely hoped, in the interests of everyone, that this strike might speedily terminate. Strikes were very barbarous methods of dealing with prices; and he hoped that some form of arbitration or agreement would be arrived at, by which such a disastrous state of things might be put an end to. With respect to the price of gas, they had as usual had a certain number of complaints from consumers, asking them if they could not reduce the charge. He had only to point out, as he had done on many occasions, that it was to their interest to sell gas at the lowest possible price within the limit of prudence. They kept the figure too low for too long a time, considering the increase in the price of wages, &c.; and the result was that their reserve fund was getting uncomfortably depleted. The reserve fund and undivided balance might, they hoped, begin to accumulate; and he trusted that at the end of the year, unless anything adverse occurred, they would be able to reduce the price. This brought him to the very thorny question of testing, which had been a sore subject for many years. The system employed was an old, an almost obsolete one. It was established as far back as 1868, when the candle used for ascertaining the illuminating power of gas in testing was standardized, and also the photometer. The burner at the same time was also fixed by Act of Parliament. The burner could not be altered; it gave the same result, in spite of improvements made in gas-burners since. The photometer had been changed (he supposed the Referees would say improved); but it adversely affected them to the extent of about half a candle. Lately the London County Council had sought to introduce a new candle, differing from the one which had been in use for the last twenty years to the extent of about one candle in illuminating power as against the gas. The Act of Parliament laid it down that the Companies should provide the candles, and that the Referees should prescribe them. The Referees had not as yet, as he understood, prescribed this new candle; so it would be a question for the Chief Gas Examiner and the Board of Trade—a system of Referees instituted as an impartial tribunal, which could be resorted to. They would be the body, he presumed, who would ultimately determine whether these candles were or were not to be used for testing in the future. All that they could say was that, if the quality of their gas was compulsorily increased by means of these improvements in the photometrical machinery and in the standard candles, they could not hope to reduce the price of gas to the same extent as they would otherwise wish to do. It meant something like 1d. to 1½d. per 1000 feet, if what had already taken place in the matter of the photometer, and what was proposed with respect to the candle, was adopted. One penny per 1000 cubic feet meant £80,000 a year on their consumption; and out of this the consumers took £66,000, and the shareholders £14,000, so that it was really more a question for the consumers than for the shareholders. He hoped that this impartial tribunal would look at the subject from that point of view, and would not force on the gas consumers a richer, more expensive, and dirtier gas, and a gas much more unsuited for use in stoves than the Company had been supplying, and with which their customers were, as a rule, perfectly well satisfied.

The DEPUTY-GOVERNOR (Mr. H. C. Ward) seconded the motion.

The GOVERNOR, after a brief discussion, in answer to questions, said he feared that the proposed new system of testing to which he had referred would involve a change in the burners and fittings. The richer the gas, the more smoke it gave, unless it was burnt in a proper burner; and he thought the result of using the richer gas with the present burners would be an excess of smoke. With regard to the law charges, they included an instalment of the amount expended by them in resisting the proposed assessments made at the last quinquennial re-valuation. This expenditure amounted to between £20,000 and £30,000; and they were allowed to spread it over a certain number of years. The increase in the rates in the half year amounted to £14,822; and if they had not successfully appealed against these assessments, the increase would have been practically £20,000. They had therefore saved the difference between these two amounts by the expenditure they incurred last year. With regard to the slot meters, he had communicated with Liverpool, and had received a very kind reply, as he had also from the South Metropolitan Company with regard to their experience of these meters. On full consideration, they were still of opinion that the Company had leisure to wait a little longer before they finally adopted this system of meters. With respect to the subject of testing, he had been asked whether the Companies were acting together; and he believed he might say that they were doing so. He had dealt with the testing question in rather a feeble manner. It was more or less technical, and was not a matter with which he could be supposed to have the same familiarity as engineers. He had been in hopes that Mr. Livesey would have given at the meeting his views on the question, because everyone knew that that gentleman had taken a great interest in the subject, and, more than that, had borne the expenses of the Commission that was sitting now. The only reason why he thought it was not desirable to attack the County Council, or anyone else, was because at the present time the matter was, to a certain extent, *sub judice*, and the tribunal referred to had not given its reply. He believed, however, he was correct in saying that the South Metropolitan Company had refused to recognize the new candle.

Mr. LIVESEY: That is so.

The GOVERNOR, continuing, said that he believed that the South Metropolitan Company had ignored the new candle, and had gone on making their gas according to the old standard. When they were attacked, or fined, or reported for deficiency, their friends would most probably reply that they were not below the mark according to the recognized standard.

Mr. LIVESEY said that an appeal in the matter was now before the Chief Gas Examiner, on the ground that the new candles were not the prescribed standard.

The GOVERNOR said the Company intended to join in this appeal, and to support it in every way they possibly could.

The motion was then unanimously adopted; and the dividends recommended were afterwards agreed to.

The GOVERNOR said the next question was the retirement of their late Secretary and General Manager (Mr. John Orwell Phillips). He had been associated with that gentleman ever since the amalgamation of the Western Company with their Company in the year 1872; and he could assure the meeting that it was with real grief he had found it necessary to admit that Mr. Phillips's health was no longer equal to allowing him to continue in a position which he had filled with such conspicuous ability for so long. Mr. Phillips was no ordinary secretary—no ordinary manager. He had been, as regarded their Company at any rate, almost the Napoleon or the Wellington of the campaign. The present position of the gas industry in London—at all events, as regarded themselves—was almost entirely due to the initiative of Mr. Phillips, backed up by the Directors; and the amalgamations which had taken place from time to time, and which had been so much in the interests of the consumers and the shareholders of the Company, were all due mainly to the devotion which their friend had given to the interests of the Company. He regretted to say that Mr. Phillips's health had not been re-established. Looking at all the circumstances of the case, and at the fact that in the amalgamations secretaries had retired after much shorter periods of service than Mr. Phillips, and much less conspicuous services, and that they had always retired, with the sanction of the Board of Trade on full pay, they thought the least they could do to mark their sense of the invaluable assistance rendered to the Company by Mr. Phillips was to propose that his retiring allowance should be four-fifths of his salary. If he had continued with them for 40 years, they would have retired him, if he had wished it, on full pay; but as he was obliged to retire after 32 years' service, they thought the most reasonable way was to calculate the allowance at 32 40ths or four-fifths of his salary. He proposed a resolution in effect asking the proprietors to confirm this decision of the Board; and he expressed a sincere hope that Mr. Phillips might live for many years to enjoy the allowance.

The DEPUTY-GOVERNOR seconded the motion, and also warmly testified to the eminent services which Mr. Phillips had rendered to the Company.

The resolution was unanimously carried.

The GOVERNOR afterwards stated that, on Mr. Phillips's resignation, it became necessary to find a successor; and they had not far to seek. They unanimously and immediately asked Mr. Field, who had been connected with the Company for many years, who was Mr. Phillips's right-hand man, who had fought the Company's battles on the assessments, and who knew everything in connection with their business, to take the position. He was quite certain, from what he had seen in the last three months, that the interests of the Company were perfectly safe in Mr. Field's hands. There had been a feeling among some of the shareholders that they would have done better to have elected as Mr. Phillips's successor a gas engineer. But the Court did not take this view; and he would remind them that Mr. Phillips, whose services had been so beneficial, was not a gas manufacturer. The Directors suggested that Mr. Field should receive the sum of £500 a year in respect of his services as Secretary, making his whole salary £2000 a year. He moved a resolution to this effect.

The DEPUTY-GOVERNOR seconded the motion, and incidentally referred to certain differences of opinion between the Company and the South Metropolitan Company. He expressed a sincere hope that any unkind feelings which might have existed were now banished.

The motion was carried unanimously.

The GOVERNOR afterwards remarked that he had omitted to mention that Mr. Field's old office of Accountant had been filled by Mr. Beavis. The way in which that gentleman had prepared the present accounts confirmed the Directors in the opinion that they had appointed the right man in the right place.

A cordial vote of thanks to the Governor and Directors terminated the proceedings.

SOUTH METROPOLITAN GAS COMPANY.

The Directors' Half-Yearly Report.

The following is the report of the Directors of the above Company, which, with the accounts for the six months ending June 30 last (to be given next week), will be presented to the proprietors at the half-yearly general meeting on the 16th inst.:—

The Directors have the pleasure to report that, notwithstanding the reduction in the price of gas to 2s. 5d. in March last, the revenue has proved sufficient to pay the dividend with all charges for interest; leaving a surplus of £1246 2s. 10d. to be added to, and carried forward with, the undivided balance, which will then amount to £6469 10s. 7d. Although the reduction named was only 1d. per 1000 feet, it is an advantage to the consumers of £28,000 a year.

Compared with the corresponding half year, coal has cost less. But, on the other hand, coke has not sold quite so well, and there is a reduction on tar; while ammonia has realized somewhat better prices. The net result, however, is that from products generally £9367 less has been received than in the half year to June, 1892.

There has been only a small increase in the consumption of gas when compared with the corresponding half year; but this is very satisfactory when the adverse effect of the extraordinarily prolonged fine and hot weather, which might have been expected to result in reduced consumption, is taken into consideration.

An entirely new, and at the same time very satisfactory feature in connection with the business of the Company is that means have at last been found which will enable gas successfully to compete with mineral oil as a lighting agent. The advantages of gas are unquestionable; but hitherto it has been out of the reach of the great bulk of the population, particularly of South London, where there are very many miles of streets of workmen's houses, in which the Company's mains supply only public lamps, with here and there a shop—the working-class inhabitants, as a rule, not being able to bear the cost of fitting up their houses, nor to pay for a supply of gas quarterly.

The "penny-in-the-slot" system has, however, been applied to the supply of gas, by fitting the necessary mechanism to a gas-meter. Like most inventions, time was required to make it practical, and to introduce the system to the consumers. About nine months ago, the Directors resolved to try it, and offered a small premium to their employees for each new customer—either for gas or for a cooking-stove—they might obtain. The Company supply and fix the necessary fittings for the consumers, who are quite willing to pay a reasonable rent, included in the price of gas. The general result is that, whereas in the year ended June, 1892, only 1752 additional consumers were secured, in the past twelve months, including orders in hand, 7603 have been obtained, of which the half year to June—the worst for getting new customers—contributes 4988.

The demand for cooking-stoves is also fully maintained; 2880 having been let on hire during the year. The total is now—in addition to a considerable number which consumers have purchased—21,600. Twenty-five per cent. of the whole number of consumers now hire a cooking-stove from the Company.

This report would not be complete without a word about the employees of all ranks, who are, generally, putting into their work an intelligent interest in the Company's prosperity. After four years' trial of the profit-sharing system, which applies to officers and workmen without distinction, the Directors have great pleasure in stating that it is working well—that the Profit-Sharing Committee of Directors, Officers, and Workmen (which deals with all questions, and brings employers and employed into friendly conference at stated times and whenever necessary) is a great power for good. Since its establishment early in 1890, there has not been any appearance of friction; and every question the Committee has had to consider has been settled most satisfactorily, and with practical unanimity. A considerable number of the workmen have shown their confidence in the Company by their investment of £4158 in the ordinary stock. Beyond this the Company hold some £30,000 of their money, consisting partly of weekly savings, but chiefly of the annual bonus under the profit-sharing scheme, which nearly one-half of the recipients leave in the Company's hands at 4 per cent. interest.

The Directors recommend the payment of a dividend at the same rate as the last—viz., 13 per cent.; but they would again draw attention to the fact that, by the requirements of Parliament since 1876, all new capital must be issued subject to the auction clauses, consequently the dividend received by a large proportion of the shareholders, though nominally 13 per cent., is actually under 5½ per cent. The dividend will be apportioned in the usual way, in accordance with the Scheme of Amalgamation, excepting a fraction due to the "A" stock, undivided as usual, and to be carried to the reserve fund.

Dorchester Gas and Coke Company, Limited.—During the past half year, this Company have had an increase in the consumption of gas amounting to 427,000 cubic feet; the total quantity consumed being 12,831,800 feet. The gas and meter rental produced £2520; residuals, £515; and miscellaneous receipts made a total income of £3058 On the other side of the revenue account, expenditure is shown to the extent of £1993; so that the profit on the six months' operations is £1065. The balance in hand available for dividend is £1105; and this will allow of the declaration of dividends of 10 per cent. on the ordinary capital and 6 per cent. on the preference capital.

BRENTFORD GAS COMPANY.

The Half-Yearly Meeting of this Company was held last Friday, at the Charing Cross Hotel—Mr. H. C. WARD in the chair.

The SECRETARY (Mr. W. Croxford) read the notice convening the meeting; and it was agreed to take as read the Directors' report and the statement of accounts for the past half year, a summary of which appeared in the JOURNAL last week.

The CHAIRMAN, in moving the adoption of the report and accounts, said he thought they might be taken as fairly satisfactory, considering the season through which they had passed. He had been a Director of the Company now for about 43 years; and they had had an experience during the past half year which had never previously fallen to his lot. For the first time, so far as he recollected, in the history of the Company, they had had a diminution of the output of the works, as compared with the corresponding period of the preceding year. They had had to seek for the reason of this. In the first place, had there been any decrease in the volume of the business? They could not find that there had; for, if they turned to the meter rental and stove rental, they saw that in both there was what might be called the normal increase. But, as the shareholders were well aware, during the half year they had had the most unusual state of the atmosphere that they had almost ever experienced; and, in point of fact, he believed that during four of the months, the temperature exceeded that of the corresponding period of 1892 by 10°; and as far as the sunshine was concerned, it had been more than double that amount. This was one of the reasons for the diminution of the output. But there were also other reasons. One was the bad state of trade in the country—he might almost say in the world; and, when trade was bad, it meant a curtailment of the business in the area they supplied with gas. There was also a movement that had been going on more or less of late, which had extended itself to their district—that was, the extension of early closing. He hoped that it was of great benefit to those who profited by it; but those who did not profit by it were the Directors and shareholders of the gas companies. These circumstances taken together had tended to produce the decrease of the output of gas. With regard to the state of the works, he had recently visited both the Brentford and Southall stations, and was highly pleased with everything he saw, especially in the case of the appliances that were being employed for economizing the working—in fact, he believed he might say that, by means of these labour-saving machines (which he dared say would eventually, in the case of the miners, deprive them of the opportunity of making themselves so disagreeable as at present), they had solved the question of foolish men striking. He had always thought that the mechanical engineer would certainly be equal to all these foolish efforts of these misguided men to force the hands of capital by strikes. Comparing the accounts with those for the corresponding half of last year, he said that the first thing to be noted was that they had expended during the six months about £8000 on capital account. This had been partially for land, new buildings, machinery, and extensions of works, and what was, of course, always a more satisfactory thing, for new and additional mains and services, meters and stoves. They carried forward a balance of capital of £14,097; and he trusted they would not want to apply to the shareholders for capital for a considerable time to come. The largest output of gas in one day last winter was 6,600,000 cubic feet; and their retort power was equal to 7,660,000 cubic feet, which left a considerable margin for increase. Besides this their storeage accommodation amounted to 9,113,000 cubic feet; so that they were in a position to conduct the works in a most economical manner, because the larger the gasholder capacity, the greater was the economy in working—they were not only able to give their workers a holiday on Sunday, but they were able to save the extra expense which their work on that day necessarily and fairly involved. Next, with reference to coals, they had during the past half-year been cheaper than in the first half of 1892—in fact, the cost had been 14s. 2d. per ton, as against 15s. 1d. in the June half of last year; and had it not been for the decrease in the amount of coal they required to consume, the 14s. 2d. would have been still lower. If they had only been able to use more coal, as they expected they would, having anticipated an increase of 3 or 4 per cent. in the consumption, they would have reduced the 14s. 2d. by at least a further 2d. or 3d. Under their new coal contracts, the price now averaged about 12s. 4d. per ton on the stage. Respecting the residual products, they were still in a very bad position. For the moment coke was somewhat better; but that was produced by a cause they all deplored—that was, the action of the miners. This, as far as their Company was concerned, had been but a sorry advantage. With respect to tar, breeze, and ammoniacal liquor, they had to wait for a general improvement in trade. The price of ammonia was improving; and this, of course, would tend to put the Company in a better position in that particular. The result was that the accounts showed a greater profit by about £8000 than for the first half of 1892—the gross profit being £31,218, as against £22,977. This had been produced partly by a rise in price, also by the reduced cost of coal, and very much by the decrease in the charge for wear and tear, which was less by between £2000 and £3000. This was brought about by what he had frequently spoken of—the changing of the horizontal retorts to the inclined system. This change (which it was necessary to effect at the expense of revenue) had been carried out to the extent of about one-third of their carbonizing plant. The net result was that they had not made the total dividend recommended by £2875; but they had a balance in hand of undivided profits amounting to £17,053, from which they supplied the deficit. Things were very unsettled at the present time, and it was dangerous to prophesy; but if the expectations of the Directors were realized, they hoped to be able to do what was an agreeable duty both to the consumers and the shareholders—that was, announce a reduction in the price of gas at Christmas. Before concluding, he said perhaps he ought to mention that the electric light had been introduced in limited areas in one or two parts of their district; but he could not say that this had caused them any great fear. He believed he saw before him some gentlemen who had already listened that day to a statement as to the results of the electric light in the case of a Gas Company which was harder hit by it than any other, and yet their rental seemed to go on increasing in a marvellous manner. With regard to this question, it might be reassuring to the shareholders if he quoted a few lines from a very admirable address delivered by Mr. Denny Lane, to the Incorporated Gas Institute, at their meeting at Belfast. Mr. Lane, speaking of Eastbourne, said: "When the electric light was started in 1882, the consumption of gas was 99,584,000 cubic feet; in 1887, 146,068,000 cubic feet; and in 1892, 207,036,000 cubic feet—an increase of 107,452,000 cubic feet, or over 107 per cent." When they considered that this increase had been made notwithstanding the electric light, he thought the shareholders had no reason to be fearful of its effect on the value of their property.

Sir R. H. WYATT seconded the motion, which was unanimously agreed to.

Dividends at the following rates per annum were next declared: 5 per cent. on the 5 per cent. preference stock, 11½ per cent. on the consolidated stock, and 8½ per cent. on the new (1881) stock.

On the motion of Mr. W. HUGHES, seconded by Mr. GIVENS, the services of the Chairman and Directors were fitly acknowledged; and the proceedings then terminated.

YORK UNITED GASLIGHT COMPANY.

The Half-Yearly Meeting of this Company was held last Thursday—Mr. J. F. TAYLOR in the chair.

The ENGINEER and SECRETARY (Mr. Charles Sellers) read the report of the Directors and the statement of accounts. The former showed that the balance of the revenue account amounted to £8941. Of this sum £349 had been paid for the half-year's interest upon money borrowed on mortgage, leaving £8591 available for division. The Directors recommended that the usual rate of dividend be declared—5s. per share upon both the old and new shares, free of income-tax. The balance of profit above the sum required for the dividend would help to recoup the surplus profits which were used to make up the deficiencies in the dividends of the two preceding years, which amounted to £2204. It was also mentioned that the business of the Company had continued to make steady progress; the gas consumption for the half year showing an increase of above 2 per cent. The market for residuals had undergone some change. Sulphate of ammonia had realized better prices; and, while the value of tar had not moved, the Directors had recently lowered the price of coke from 12s. 6d. to 10s. per ton. The Directors added that this great reduction of 20 per cent. in the price of coke would tell upon the Company's revenue; but they trusted that the reduced coke revenue would be wholly or partially met by the more favourable coal contracts into which they had recently entered. With regard to the works, the addition of a new boiler and exhauster, and the erection of two extra beds of retorts on the new works, and the interlapping of the purifying plant on the old and new works so as to secure more economical working, had been successfully carried out; and the Directors were now negotiating with the North-Eastern Railway Company for the extension of the Company's railway siding.

The CHAIRMAN, in moving the adoption of the report, said that, although they had made a reduction in the price of coke, the financial result of the half-year's working was very satisfactory. The price of coal very closely affected their business; but with respect to the coal strike, the Directors had provided for the effects of the unhappy dispute in a manner which they thought would tide them over any coming difficulty. The coal contracts had been made upon better terms than for some time past; and this would enable them to meet the loss they had sustained through the reduction in the price of coke.

Mr. W. W. WILBERFORCE seconded the motion, which was unanimously agreed to.

Resolutions were then passed declaring the dividend recommended, re-electing the retiring members of the Board, and thanking the Chairman and Directors for their services.

Exhibition of Gas Appliances at Penryn.—On Monday last week, Messrs. Fletcher, Russell, and Co., Limited, opened an exhibition of gas appliances in the Penryn Town Hall; Miss Gertrude Cole giving cookery lectures. The exhibition remained open till Friday.

The Leicester Gas Exhibition.—The exhibition of gas appliances at Leicester, which was opened on the 10th ult., as already noticed in the JOURNAL (*ante*, p. 135), was so successful that it was continued for three weeks; the attendance gradually increasing until in the last week as many as 5000 people visited it nightly. It is estimated that over 1700 gas-stoves were let on hire during the period of the exhibition. All the principal gas-stove manufacturers exhibited; the largest and most attractive displays being made by Messrs. Fletcher, Russell, and Co., Messrs. W. Parkinson and Co., Messrs. Richmond and Co., Messrs. W. Sugg and Co., and Messrs. J. Wright and Co. The exhibit of Messrs. W. Sugg and Co. consisted of a selection of "Westminster" gas kitcheners (three sizes), "Westminster" double gas kitcheners, and "Westminsters" with extended hot plates, all fitted with Sugg's patent enamelled, ribbed top plate under the hot-plate. Also a number of Sugg's Patent "Cromartie" lamps, ventilating sunburners, patent "Christiania," "London" Argand, and other governor burners, &c. The firm also had on view several kinds of gas-fires, and a complete selection of Sugg's patent inlet and outlet ventilators, ventilating gas-lights, &c. As already mentioned, all the arrangements for the exhibition were carried out by Mr. Alfred Colson, the Corporation Gas Engineer, with remarkable energy and success; and the spirited enterprise of the Gas Department has been fully justified by the way in which the consumers took up the matter. Leicester has a very large (probably the largest) number of gas cooking and heating stoves in use, in proportion to the population, of any town in the kingdom; and the pamphlet issued by Mr. Colson some years since has no doubt done very much to increase the use of gas-stoves in the country generally. The low rates for the hire of stoves, and the facilities offered to consumers, also explain the great sale of gas in Leicester for cooking and heating purposes.

THE CRISIS IN THE COAL TRADE.

The Miners' Reply to the Coalowners' Manifesto.

Mr. T. Ashton, General Secretary of the Miners' Federation of Great Britain, issued last week, on behalf of the executive at Manchester, the following reply to the recent manifesto of the masters (see *ante*, p. 223):—

Messrs. Ellis and Rhodes, Joint Secretaries to the Coalowners' Federation, on July 25 issued a statement on the present crisis, on behalf of the coalowners. An attempt is made to justify the owners' position before the general public. The first paragraph contains the Chairman's explanation at the last joint meeting on the 25 per cent.; but as that was given to the Press in full at the time when the meeting was held, what need is there for this repetition? The second paragraph states that selling prices, which were at their lowest point about July, 1888, began to improve, and an advance in wages of 10 per cent. was conceded. The facts are that no advance was given at that time until all conciliatory means had failed, and a general demand was made by the miners, and notices given to cease contracts; and even then 30,000 miners in Yorkshire, and 6000 in Derbyshire, were on strike a week for the advance. Miners' wages at that time were much too low; and their organization was powerless to act, in their isolated state, to improve their position; and it was only by several counties uniting together that forced the employers in 1888 to concede the advance of 10 per cent. The second and third advances in 1889-90 were obtained with less friction. But when the fourth was asked for, and then demanded, the miners were met with strong opposition; and it was not until after nearly 200,000 miners had been on strike four or five days that the advance was conceded. Although prices had gone up so high in 1890 that collieries were paying big dividends which were working at little or no profit in 1888, yet it required a strike of 200,000 miners to force the advance of 10 per cent. in wages. The Miners' Federation of Great Britain was established to get and keep a comfortable living rate of wages for its members. Who will say that miners' wages are too high at present? The average rate of underground wages is not more than 8d. per hour from bank to bank. Considering the laborious and dangerous and most inconvenient nature of the work, very few can be found—not even among the coalowners themselves—to say that wages are too high. When the last advance of wages was received in 1890, selling prices were not at the highest point, as districts whose wages were regulated by a sliding scale proved. In South Wales, ascertainments of selling prices were made by accountants; and miners' wages in those districts were advanced several times after the final settlement of wages with the federated coalowners' and miners' representatives. The Federation of Great Britain were content for wages to remain at the rate then obtained, and never asked for any further advance. The present rate is considered fair; and the Federation will fight hard to keep it. If the men now engaged in the present struggle were forced in at the reduction, I believe the Federation would again rally its forces at a more opportune time before the end of the present year, and renew the fight with greater determination. The workmen's case is simple and clear. They did not reap their share of the profits on the high selling prices. They never asked for that. They struggled to establish a fair, just, and reasonable rate of wages; and having accomplished that, will fight campaign after campaign, if needs be, to keep it.

GLASGOW CORPORATION GAS AND ELECTRICITY SUPPLY.

Annual Report.

The Gas Supply and Electric Lighting Committee of the Glasgow Corporation have issued their report for the year ending May 31. It states that the gross revenue of the Gas Department amounts to £594,049, and the gross expenditure to £464,449, to which is added depreciation, written off capital, £34,419—leaving a balance of £95,181 to be carried to the profit and loss account. After meeting the payments for annuities on stock, interest on borrowed money and sinking fund, there remains a surplus on the year's operations of £29,539. Out of this sum the Committee have met the balance at the debit of the previous year's accounts of £26,140, the loss of £1773 on the electric lighting account, and have transferred £1500 to the insurance fund—leaving a balance of £126. This very gratifying result of the year's operations, and the fact that the contracts for coal, advertised for as usual, had been fixed for the quantity required during the coming year at prices considerably under those of last year, enabled the Committee to recommend that the price of gas should be reduced from 2s. 9d. to 2s. 6d. per 1000 cubic feet—this reduction to take effect retrospectively as from the date of the last survey. The sum received for tar and liquor shows a reduction of 8·8d. per ton on the quantity of coal carbonized, as compared with the previous year, which is equivalent to a loss of income of over £17,000. The quantity of gas sold or accounted for during the year has been 3,819,039,000 cubic feet; being an increase over the previous year of 4·80 per cent. The sinking fund, with accumulations, now stands at £266,446. In the Electric Lighting Department, the gross revenue from March 1, 1892, to May 31, 1893, amounted to £7784, and the gross expenditure to £5417, to which was added depreciation written off capital, £1328; leaving a balance of £1039. The Committee had to meet interest on loans, £2012 18s. 10d.; payment to sinking fund, £800; and, deducting these sums from the credit balance, there remained a deficiency amounting to £1173, which was transferred to the debit of the gas account. The above result was not unexpected by the Committee during the first year's operations. The capital expenditure on the new system during the greater part of the year was unproductive of revenue; and, in the meantime, interest had to be paid upon the money borrowed. The Committee fixed the price of electric energy from June 1, 1892, at 7d. per unit, at which figure they recommend it should be continued for the current year. During the period covered by the accounts, the Committee have purchased ground at the corner of Waterloo and Main Streets, and have erected thereon a central supply station, which, with machinery and plant, has cost £44,000. The Committee are glad to state that not only will these works be fully employed during the winter, but that it has already been found necessary to extend the plant in order to meet the increasing demand for current; and they hope that the future reports of this enterprise will show an increasing prosperity from year to year. The number of consumers when the undertaking was acquired by the Corporation was 37; while the number on May 31 last was 108.

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

This week the annual accounts of the Glasgow Gas Trust, dealing with both the gas and electric lighting supply, have been issued. With regard to the gas department, there can be nothing but satisfaction. The year started with a deficit of £26,139, to wipe out which the price of gas was raised from 2s. 6d. to 2s. 9d. per 1000 cubic feet. The object has just been accomplished—the free surplus being only £126. Still, it is always sufficient to effect one's purpose; and the Treasurer to the Trust deserves to be congratulated on the foresight which he exhibited when framing the estimates a year ago. The coincidence of the estimates with the result is the more remarkable, when the cross-purposes which circumstances imposed upon the Corporation are taken into account. On the one side, there were the additional 3d. per 1000 cubic feet, the saving in the cost of coal, and any increased output which might be experienced, to be placed to the assistance of the revenue; on the other side, there was the decrease in the price derived from residuals (which has in actuality amounted to £17,000), the deficit of last year, and the loss upon the electric lighting installation, to be reckoned with as detracting from a favourable issue of the year's working. It certainly is a sign of careful designing of policy, and as careful carrying of it out, that, with all these conflicting forces at work, the result should be so near the expectation. The revenue of £594,049 is £46,576 above the revenue for 1891-92; and the expenditure of £464,449 is £34,040 less than it was in that year. These are both in the right direction, and were both helpful. The £34,040 which was saved upon expenditure was due chiefly to the fall in the price of coal; but a certain proportion was doubtless owing to the improved appliances introduced by Mr. Foulis into the works. How much these are responsible for, the accounts do not show; but the Convener of the Finance Committee may refer to it when he comes to move the accounts in the Town Council. The gas sold amounted to 3,819,039,000 cubic feet; and, despite the increased price and not over brilliant trade, it was really 175,763,000 cubic feet above the quantity reported for 1891-92. The increase is stated as 4·80 per cent. A year ago it was stated to have been 16·54 per cent. over the quantity in 1890-91; but the comparison was not of much value, as the Corporation had acquired the Temple Farm works of the Maryhill, &c., Company, which disturbed the calculation. The accounts will come before the Town Council at their next meeting.

With regard to the electric lighting department, little can be said, because it has not been in full working order for the entire year, whereas the Corporation have had to meet interest upon capital for the whole of that period. The Committee, however, write hopefully, seeing that they have been able to increase the number of customers from 37 to 108. I am sure no one will grudge them whatever satisfaction they may be able to extract out of the contemplation of this increase of 71 customers. It does seem, however, when one reckons up that each customer has to bear, in addition to the cost of working, a yearly charge of £26 for interest on capital and contribution to sinking fund, that the prospects of cheap electricity are not very promising. Of course, as a matter of fact, each customer does not bear that charge, because the deficit is made up out of the surplus arising upon the gas revenue, as has been done this year. How long this is to go on, it lies with the gas consumers to say; but as they are an unorganized body, it is improbable—at least, unless the burden should get much heavier than it is—that they will complain. Suppose it were the other way. Last year there was a deficit in the gas department; what would the customers of the electric lighting department say if, should the same occur again, they were obliged to pay more for their electricity in order to assist the gas department? One feels comfort in thinking that, notwithstanding all the great things which have been predicted of electric lighting, such a contingency is not likely to happen. There is, however, this question in the idea: Have the Corporation power to "milk" the electric lighting department for the benefit of the gas department, as they do the gas for the benefit of electricity? If they have not, the circumstance shows the expectations which the promoters of electric lighting, or at least which the Legislature, had of the prospects of electric lighting. If there had been even a suspicion that electric lighting would supplant gas lighting, the provision would surely have been made reciprocal, so that when the time came that the decrepit old gas industry was tottering to its fall, it should be assisted by the new "giant" to make as easy an exit from this world as possible. "There is room for both," say the electricians; and certainly no one would grudge them what room they want, if they would make it at their own expense, and not at the expense of the industry some of them aim at extinguishing.

At the monthly meeting of the Edinburgh and Leith Gas Commission on Monday, the Engineers reported an increase in the output for the month of June amounting to 866,000 cubic feet. A remit was made to Mr. R. Mitchell, the Engineer of the Edinburgh works, to inquire and report as to the cost of manufacturing and distributing water gas. As the Commissioners are about to experiment with the production of oil gas by the Peebles process, it is scarcely possible that they will, for some time at least, go in for any expenditure upon water-gas plant. The remit, all the same, is most opportune, as showing that the Commissioners either themselves keep their eyes open to what is going on in the gas industry, or are kept posted up to date by their officials—most probably the latter. If Mr. Mitchell's report upon water-gas processes turn out to be as full and complete as was his report upon the Peebles oil-gas process, the document will certainly be both interesting and valuable. Speaking of the

Peebles process reminds me that, according to Mr. Mitchell's remarks at Dundee last week, the Edinburgh installation of 21 oil and 28 tar or coal retorts will be the largest plant yet started for the working of the system. This week I met a gentleman whose acquaintance with gas subjects is extensive; and, in conversation upon the Peebles process, he gave expression to the opinion—which I fancied was a mirroring of the sentiments of some who have not spoken out—that there might be difficulty in working it on a large scale, on account of the heavier specific gravity of the oil gas causing it to stratify in the holders. My recollection is that Mr. Young stated to me that there was no difficulty in the commingling of the oil and coal gas; but, of course, Peebles is a small place, and stratification might not be so easily observed in the holders. It will be different in Edinburgh. If stratification should take place, it should be easily detected; and I commend the matter to Mr. Mitchell as one of the points in the working of the process which he might look into, so as to set at rest a matter on which there appears to be scepticism in some quarters.

The Commissioners, without comment, adopted the accounts for the year; and, in terms of the recommendation of the Finance Committee, they set apart to the sinking fund for the repayment of borrowed money £1346 19s. 8d.; to the sinking fund for the redemption of annuities, £7224 15s.; and carried forward the balance of £29,668 12s. 6d. to the current year's account—making, with £27,180 carried forward last year, a sum of £56,848, which the Commissioners now hold in hand as a working balance.

A little incident occurred which shows how the judgment of a public man may be warped by his political leanings. The Commissioners have for the past year or two been endeavouring to work up a gas-stove trade; and, in order to foster it, they have resolved that stoves hired through their agency shall be fitted up in the consumers' houses at cost price, the Commissioners making no profit on the transaction. This arrangement was "spotted" by a labour member of the Commission as a ground of complaint; his objection to it being that the Commissioners were underselling men employed in the same trade. Out of deference to him, or rather to his constituents, a remit was made to the Works Committee to consider whether a percentage should not be charged upon the consumer to cover the cost of fitting up. What benefit the workmen would receive were such a charge made, it is difficult to see. They do not suffer by the present arrangement, because they get their wages, and it is the Commissioners who do not make any profit. More than that, were a charge imposed fewer stoves would be taken; and the workmen would then get less work, and consequently less wages. A cry of underselling is, however, a good one to go to the poll with.

Another subject which the Commissioners had before them was one of some importance, and a more legitimate one than that which is referred to in the last paragraph. A letter from the Electric Lighting Committee of the Edinburgh Corporation was read, asking the Commissioners to supply gas for the driving of the engines are to which work the electric lighting plant, at the same rate as is charged for that consumed in the public lamps—viz., 1s. per 1000 cubic feet less than the price to ordinary consumers. It is significant to observe that the Corporation are proposing to drive their electric lighting plant by means of gas-engines. The arrangement would do away with the difficulties they are having with regard to sites for electric lighting stations, and it would provide a revenue for the Gas Commissioners as well. There was a feeling expressed that the Commissioners should not accede to the request, on the two grounds that they would thereby be enabling the Corporation to take away their best customers, and that the charge for the gas used in public lighting was already too low—in fact, that between the loss upon it and the discounts which are given, the charge upon ordinary consumers is at present 2d. per 1000 cubic feet higher than it need be. This is a phase of the subject which is worthy of attention, because it is not good financing to sell gas to the Corporations of Edinburgh and Leith at less than cost price; and the Commissioners acted rightly in sending the letter to the Works Committee to consider.

The Coatbridge Gas Company, which stands in the unique position of being now the only incorporated gas company in Scotland, have this week held their half-yearly meeting. The revenue reported was £6892; and the amount available for dividend, £3660. Out of this, 10 per cent. was paid upon the original capital of £12,650, and 7 per cent. upon the new capital of £32,000. The output of gas during the half year was 35,697,500 cubic feet; unaccounted-for gas amounting to 13·19 per cent. Mr. Thomas Wilson, the Manager, has every reason to be pleased with the working results—the total cost for manufacture, distribution, &c., only amounting to 2s. 1·99d.

Sulphate of ammonia still continues to advance in price—being now quoted at from £13 10s. to £13 15s. per ton on spot and near down- and £12 10s. for winter delivery. The prices last year were from £9 2s. 6d. to £10 2s. 6d.; and in 1891, £11.

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *Aug.* 4.

Sulphate of Ammonia.—For lack of spot parcels, the business is very limited; and prices naturally continue to harden. Quotations run between £13 10s. and £13 15s. Although the latter figure has not been paid yet, sellers seem sanguine of getting it; and they expect to realize over £14 before the end of the month. Sulphate certainly has never been scarcer; and any urgent requirements may cause this extreme level to be touched. A fair business is being done in forward contracts; but the bulk of the Continental consumers seem inclined to assume a passive attitude—these high prices standing much in their way in effecting sales.

LONDON, *Aug.* 4.

Tar Products.—Large business is reported in benzols, which looks as if buyers had concluded that the bottom had been touched. Unfortunately, distillers have heavy stocks, and as the season advances are becoming rather anxious to sell. Considerable interest has been excited among distillers in the discussion going on as to the relative values of tars. The skill displayed by some gas managers in retaining the lighter and more valuable products of the tar in the gas, seriously depreciates the value of the tar resulting therefrom; while with the higher temperature now mostly resorted to in carbonizing, the phenoloid bodies are "cracked" into benzol, which chiefly goes into the gas and naphthalene, which is of little or no use to the distiller. Tar acids, although in good request, show no improvement in prices; while other products are flat and difficult to sell. Business is reported during the week as follows: Tar, 13s. Pitch, 23s. to 24s. Benzols, 90's and 50's, 1s. 4½d. Solvent naphtha, 1s. 1d. Toluol, 1s. 4d. Crude benzol naphtha, 30 per cent., 6¾d. Creosote, 1d. Creosote salts, 15s. Carbolic acid, 60's, 1s. 6d.; crystals, 6½d. Cresol, 1s. 6d. Anthracene, nominal, 30 per cent., "A," 1s.; "B," 8½d.

Sulphate of Ammonia is very scarce; and the little business that has been done has realized £13 10s. to £13 12s. 6d., less 3½ per cent. Sellers are asking £13 for forward delivery; and there is no doubt that buyers will have to pay at least this price to cover their wants for the ensuing season. Gas liquor is quoted at 9s. 6d. to 10s. 6d.

COAL TRADE REPORTS.

From Our Own Correspondents.

Lancashire Coal Trade.—The recent excessive buying in the coal trade of this district has not only fallen off, but a quiet tone generally has now come over business. For the most part, consumers have tolerably well covered for the present; and the further advance in prices which has taken place during the past week has tended to check any eagerness to place out further orders. Of course, in the event of a protracted stoppage of the pits, which is now generally looked forward to as probable, the lull in the demand will only be temporary; and should a further rush of buying come forward, this will no doubt tend to force prices up still higher. So far, the advance in the Manchester district is 3s. 4d. per ton upon the pit, wharf, and delivered rates, for all descriptions of fuel, except that in one or two cases burgy and slack have only been advanced 1s. 8d. The railway prices for deliveries of coal in waggons to outside districts have been put up 3s. 4d. to 4s. per ton, and in some cases even more than this. In the West Lancashire district, there has been an all-round general advance of 5s. per ton; while in the open market, all sorts of prices are being quoted for special supplies. It is difficult to give anything like really definite quotations. The better qualities of round coal are not now quoted under 14s. to 15s.; second qualities, 12s. 6d. to 13s.; and common, about 11s. to 12s.; with engine fuel at about 10s. to 11s. per ton at the pit mouth. In some cases, any special distinction between different qualities of round coal has for the time being been practically done away with; and it is being supplied as through-and-through from the stocks at one fixed price. So far the colliery owners have had no difficulty in securing labour sufficient to fill up coal out of stocks on the pit banks; their only anxiety now seems to be to economize them as much as possible. In some cases they are quoting advanced prices, with a view of limiting the orders that are coming forward; and in others they have ceased offering at all for the present, as they prefer seeing how things turn out before letting the whole of the stocks go. It is only in a very few cases that colliery proprietors have any quantity of engine classes of fuel left in stock. For the most part, the stocks on the pit banks now consist almost entirely of the better qualities of round coal; all the lower qualities having already been largely drawn upon for steam, forge, and general manufacturing requirements. The result is that consumers for manufacturing purposes who have not covered their requirements, have, to a large extent, to fall back upon house-fire qualities of coal, for which, of course, they have to pay the full advanced rates. There is, however, a growing disposition rather to stop works than to pay exceptionally high prices for fuel to keep them going; and some of the local forges have already been shut down, while the pig iron and blast-furnaces in the district are in many cases also being damped down. The general expectation is that the stoppage will extend over a couple of months. Certainly there is no disposition on either side, at present, to put forward any practicable suggestions for a settlement of the question.

Northern Coal Trade.—The effect of the strike in the Midlands is beginning to make itself perceptible in the north-eastern coal trade now, but more in the shape of larger demand and slight additions to prices than in any other way. There is an increased demand for coal of all classes; but it is spread over a wide area, so that there is not that large addition to the quantities sent out that some had anticipated. Best Northumbrian steam coals are being freely worked; and the bulk of these are sent out at old rates. There are, however, small lots selling for prompt delivery at prices that vary from 10s. 6d. up to 12s. 6d. per ton, according to the needs of the purchasers. Second-class steam coals are also in request, with a corresponding variation in the price; and small steam coals are quoted at from 4s. 6d. to 6s. Thus, according to the extent of the coal that is not contracted for, some of the coalowners are benefiting slightly by the strike. Manufacturing coals are firm; and there have been some considerable quantities sold to be sent to other districts, at rather higher prices. Gas coal is now being largely delivered, both to local and to distant gas companies, who desire under the circumstances to keep up the large stocks of coal that some of them have acquired. For lots that are urgently needed, some high prices have been paid—as high as 10s. per ton having been quoted; and from that down to 7s. 6d. per ton f.o.b. is the current rate. There is very little alteration in smithy coal; but all the shipments are well kept up. Coke is firm, and is being sold more largely both for shipment and for local use. The price for best Durham coke, at the furnaces, is now 13s. 6d. per ton; and there is an advance in the rate for shipment also. Gas coke is so far unaltered in price; but there is a good local demand, and the output is rather larger than it was.

Scotch Coal Trade.—Now that the struggle in England has begun, there is more activity among coalmasters in Scotland. There is a good demand for all classes of coal, but mostly for forward orders, to fill up the blank which will arise should the stocks in England get exhausted. Coalmasters are, too, not very anxious to enter into for-

ward contracts, because they do not know what may be the outcome of the agitation among the Scotch miners for increased wages. On that subject there is a good deal of uncertainty. Although a strike is threatened, there is not much eagerness shown upon either side to hurry forward a crisis; and negotiations between masters and men proceed slowly. Both sides are apparently waiting to see how matters will develop in England; and if the strike there should continue, it is likely that a compromise will be effected in Scotland, so as to get hold of as much trade as possible. Almost the only uncertain factor in the estimate of events is the effect which Federation requirements may have upon the men; but that, too, will be revealed in time. The quotations are: Main, 7s. 6d.; ell, 8s. 6d. to 9s.; splint, 7s. 9d. to 8s.; and steam, 8s. 6d. to 8s. 9d., f.o.b. Glasgow. The holidays being over, shipments were better than in the preceding six days. The total was 140,864 tons—an increase upon the preceding six days of 22,744 tons, but a decrease as compared with the corresponding week of last year of 11,227 tons. For the year to date, the total shipments have been 3,838,857 tons—this being a decrease on the same period of 1892 of 392,391 tons.

Gas-Engines at the Yorkshire Agricultural Society's Show.—Among the numerous exhibits at the annual show of the Yorkshire Agricultural Society at Dewsbury last week was a representative collection of gas-engines. Messrs. Crossley Bros., Limited, of Manchester, had several new specimens of their engines—two of the new types being 2-horse power vertical and horizontal machines. The horizontal engine was at work driving a Crompton dynamo; and, both being fixed on the same bed-plate, a steady and reliable installation is thus gained for about 20 lights. Tangyes, Limited, of Birmingham, had on view two of their engines on the "Otto" principle; and various examples of their manufactures were shown by the Campbell Gas-Engine Company, Limited, of Halifax—among them being a 2-horse power nominal "Campbell" oil-engine.

Sale of Gas Shares and Water Annuities at Bury.—At the Derby Hotel, Bury, last week, Messrs. S. Jackson and Son offered for sale by public auction a large number of gas and water shares. The following sales were effected: Fifteen new ordinary £10 shares in the *Rossendale Union Gas Company* (fully paid), at £18 10s. each; fifteen Amendment Act £10 shares (fully paid), at £14 6s. each; six 1876 Act £10 shares in the same concern (£5 paid), at £7 17s. each; and three new Amendment Act £10 shares (£4 10s. called up, £5 10s. paid in advance of calls), at £12 7s. 6d. each; £400 consolidated "B" stock in the *Liverpool United Gas Company*, at £156 10s. per £100; £550 consolidated stock in the *Newcastle and Gateshead Gas Company*, at £185 per £100. A number of perpetual water annuities payable by the *Bury Corporation* were disposed of at 32 years' purchase.

The Position of the Manchester Water Supply.—Sir John Harwood stated at last Wednesday's meeting of the Manchester City Council that the water in stock at Woodhead was less by six days' supply than it was last month, when it stood at 43 days. If the water had not been cut off in the city during the night, they would only then have had 28 days' supply, which would have been of a very inferior quality. The Committee were much gratified at being able to say that for the previous ten days they had been able to hold their own; the supply being replenished as it was used. Mr. Tunstall subsequently remarked that he thought the work at Thirlmere was hanging on hand a long time; and he wished to know whether a temporary supply could not be obtained in a few days. Sir John replied that they had had two weak spots to contend with, and other ways had had to be found of dealing with them; but it would be imprudent to say what course the Water Committee intended to pursue. He could assure the Council that they were doing everything in their power to get the work done in the shortest space of time.

GAS AND WATER COMPANIES' STOCK AND SHARE LIST.

(For Stock Market Intelligence, see ante, p. 257.)

Issue.	Share	When ex-Dividend.	Dividend or Div. & Bonus.	NAME.	Paid per Share	Closing Prices.	Rise or Fall in Wk.	Yield upon investment.
£			p. c.	GAS COMPANIES.				£ s. d.
590,000	10	13 Apl.	10½	Alliance & Dublin 10 p. c.	10	17—18	+½	5 16 8
100,000	10	,,	7½	Do. 7 p. c.	10	11½—12½	..	6 0 0
300,000	100	1 July	5	Australian (Sydney) 5 % Deb.	100	102—104	..	4 16 2
100,000	20	31 May	8	Bahia, Limited	20	10½—11½	..	13 18 3
200,000	5	12 May	6½	Bombay, Limited	5	5½—6	..	5 8 4
40,000	5	,,	6½	Do. New	4	3¾—4¼	..	6 2 6
380,000	Stck.	24 Feb.	11½	Brentford Consolidated	100	222—227	..	5 1 4
180,000	,,	,,	8½	Do. New	100	168—173	..	4 18 3
220,000	20	15 Mar.	11½	Brighton & Hove Original	20	41—43	..	5 6 11
888,500	Stck.	31 Aug.	5	Bristol	100	104—107	..	4 13 5
320,000	20	13 Apl.	11½	British	20	42—44	..	5 4 7
50,000	10	15 Mar.	11½	Bromley, Ordinary 10 p. c.	10	19—20	..	5 15 0
51,510	10	,,	8½	Do. 7 p. c.	10	15—16	..	5 6 3
328,750	10	28 July	2	Buenos Ayres (New) Limited	10	5½—6¼*	..	3 1 6
200,000	100	1 July	6	Do. 6 p. c. Deb.	100	97—100	..	6 0 0
150,000	20	13 July	8	Cagliari, Limited	20	25—27	..	5 18 6
550,000	Stck.	28 Apl.	12½	Commercial, Old Stock	100	243—248	..	5 0 10
165,000	,,	,,	9½	Do. New do.	100	185—190	..	5 0 0
160,762	,,	15 June	4½	Do. 4½ p. c. Deb. do.	100	125—130	..	3 9 3
800,000	Stck.	15 June	13	Continental Union, Limited	100	228—233	+1	5 11 6
200,000	,,	,,	10	Do. 7 p. c. Pref	100	190—195	..	5 2 7
75,000	Stck.	15 Mar.	10	Crystal Palace District	100	190—193	..	5 2 7
486,090	10	28 July	10	European, Limited	10	21—22*	..	4 10 11
354,060	10	,,	10	Do. Partly paid	7½	15—16*	..	4 13 9
5,646,590	Stck.	10 Feb.	12	Gaslight & Coke, A, Ordinary	100	227—232	+1	5 3 5
100,000	,,	,,	4	Do. B, 4 p. c. max.	100	95—99	..	4 0 10
665,000	,,	,,	10	Do. C, D, & E, 10 p.c. Pf.	100	263—268	..	3 14 7
30,000	,,	,,	5	Do. F, 5 p. c. Prf.	100	120—125	..	4 0 0
60,000	,,	,,	7½	Do. G, 7½ p. c. do.	100	175—180	..	4 3 4
1,300,000	,,	,,	7	Do. H, 7 p. c. max.	100	170—175	..	4 0 0
463,000	,,	,,	10	Do. J, 10 p. c. Prf.	100	262—267	..	3 14 10
476,000	,,	,,	6	Do. K, 6 p. c. Prf.	100	157—162	..	3 14 1
1,061,150	,,	15 June	4	Do. 4 p. c. Deb. Stk.	100	125—128	..	3 2 6
294,850	,,	,,	4½	Do. 4½ p. c. do.	100	128—132	..	3 8 2
908,000	,,	,,	6	Do. 6 p. c. do	100	172—177	+2	3 7 9
3,800,000	Stck.	12 May	12	Imperial Continental	100	220—225	..	5 6 8
75,000	5	15 June	6	Malta & Mediterranean, Ltd.	5	5—5½	..	5 9 1
560,000	100	4 Apl.	5	Met. of Melbourne, 5 p. c. Deb.	100	103—105	..	4 15 3
541,920	20	15 June	5	Monte Video, Limited	20	13—14	..	7 2 10
150,000	5	31 May	10	Oriental, Limited	5	7½—8	..	6 5 0
60,000	5	29 Mar.	7	Ottoman, Limited	5	4¼—4¾	..	7 3 8
166,870	10	—	2	Pará Limited	10	2—2½	..	—
				People's Gas of Chicago—				
420,000	100	2 May	6	1st Mtg. Bds.	100	100—105	..	5 14 3
500,000	100	1 June	6	2nd Do.	100	98—102	..	5 17 8
150,000	10	28 Apl.	5	San Paulo, Limited	10	8½—9½	..	5 5 3
500,000	Stck.	24 Feb.	15½	South Metropolitan, A Stock	100	297—302	..	5 2 8
1,350,000	,,	,,	12	Do. B do.	100	244—248	+1	4 16 9
230,000	,,	,,	13	Do. C do.	100	253—258	..	5 0 9
750,000	,,	13 July	5	Do. 5 p. c. Deb. Stk.	100	147—151	..	3 6 2
60,000	Stck.	15 Mar.	11½	Tottenham & Edm'nton, "A"	100	215—220	..	5 4 6
				WATER COMPANIES.				
744,897	Stck.	29 June	10	Chelsea, Ordinary	100	259—264	..	3 15 9
1,720,252	Stck.	29 Mar.	8	East London, Ordinary	100	210—215	+2	3 14 6
544,440	,,	29 June	4½	Do. 4½ p. c. Deb. Stk.	100	140—143	..	3 2 11
700,000	50	15 June	8½	Grand Junction	50	109—112	..	3 15 10
708,000	Stck.	10 Feb.	11	Kent	100	280—285	..	3 17 2
1,043,800	100	29 June	9½	Lambeth, 10 p. c. max.	100	239—241	+2	3 17 10
406,200	100	,,	7½	Do. 7½ p. c. max.	100	197—202	+2	3 14 6
310,000	Stck.	29 Mar.	4	Do. 4 p. c. Deb. Stk.	100	129—132	..	3 0 7
500,000	100	10 Feb.	12½	New River, New Shares	100	329—334	..	3 12 8
1,000,000	Stck.	28 July	4	Do. 4 p. c. Deb. Stk	100	132—135*	..	2 19 3
902,300	Stck.	15 June	6	S'thwk & V'xhall, 10 p. c. max.	100	149—154	..	3 18 0
126,500	100	,,	6	Do. D 7½ p. c. do.	100	140—145	..	4 2 9
1,155,066	Stck.	15 June	10	West Middlesex	100	256—261	+3	3 16 7

*Ex Div

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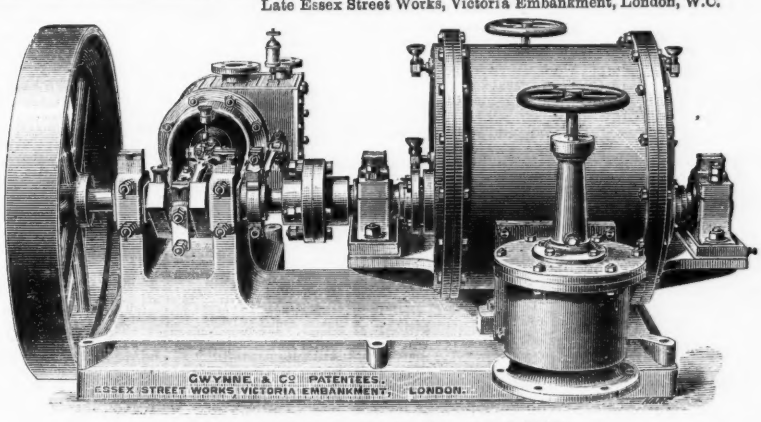

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Further Particulars may be had from Mr. HENRY GREEN, Gas Offices, Fishergate, PRESTON; or from Mr. T. WHITEHEAD, Solicitor, 54, Fishergate, PRESTON.

IRISH BOG ORE OXIDE OF IRON.

GAS PURIFICATION.

BALE & CO., direct Importers from Ireland. Sample and Price on application.
OXIDE PAINT, SULPHURIC ACID, & Chemicals.
120 and 191, NEWGATE STREET, LONDON, E.C.
Telegrams: "BOGORE, LONDON."

OXIDE OF IRON.

FINEST Quality of Natural Bog Ore.
Particulars and price, apply to Mr. T. L. ARCHER, 20, Fennel Street, MANCHESTER.

MESSRS. DEBENHAM, TEWSON, FARMER, and BRIDGEWATER'S MONTHLY LIST of Shops, Show-Rooms, Factories, and Waterside Premises, suitable for the Exhibition and Manufacture of Engineering and other Appliances, may be obtained, free of charge, at their Offices, 80, CHEAPSIDE, E.C.

LIQUOR, Tar, and Spent Oxide wanted.
BROTHERTON AND CO., Ammonia and Tar Distillers, BIRMINGHAM, LEEDS, and WAKEFIELD.

SULPHURIC ACID.

JOHN NICHOLSON & SONS, Chemical Works, LEEDS, specially produce this ACID from BRIMSTONE, for making SULPHATE OF AMMONIA of high quality and *good* colour. Delivery in our own Railway Tank-Wagons or Carboys. Highest references and all particulars supplied on application.

SADLER AND CO., LIMITED, MIDDLESBROUGH; ULVERSTON (BARROW); PORTSMOUTH; CARLTON; STOCKTON; 315, St. Vincent Street, GLASGOW; and 85, Water Street, NEW YORK. Tar Distillers, Manufacturers of all TAR PRODUCTS, ALIZARINE and other TAR COLOURS, BICHROMES, OXALIC ACID, ALKALIES, LIQUOR AMMONIA, AMMONIA SULPHATE, &c.
Head Office: MIDDLESBROUGH. Correspondence invited.

FOR SALE—A second-hand, combined CONDENSING AND PURIFYING APPARATUS, with two boxes 3 ft. by 2 ft. 6 in. each; 4-inch Centre-Valve; Lifting Gear, &c., complete. Suitable for experimental or small Gas-Works.
For further particulars apply to EDW. LONG, Secretary, Sutton Valence Gas Company.

TO BE SOLD—Hydraulic Main, 20 H-PIPES and ASCENSION PIPES, MOUTHPIECES and LIDS; also Twelve Spare LIDS.
CONDENSER, 14 Pipes, 8 inches diameter, 24 feet each, and Valves.
WASHER, Complete, by Laycock and Clapham, 12-inch inlet, and 12-inch outlet, with Valves.
SCRUBBER, Complete, by Bland and Sons, Bury, 27 ft. by 5 ft.
PURIFIERS (four), by Walkers, 7ft. by 7 ft., with Railway Lifting Crane.
STATION METER, by Braddocks, to pass 10,000 cubic feet per hour, with Clock and Indicator.
TAR-BOILER, 19 ft. by 5 ft.
Quantity of 12-inch MAINS.
The above are in good Condition, and will be sold together or separately.
May be inspected, and particulars obtained, on application to Box 131, Post Office, MANCHESTER.

TENDERS wanted for about 2000 tons of FLINT COLLIERY CANNEL in stock at Colliery. Price to include loading into trucks. Analysis on Application.
Apply to the NEW FLINT COAL AND CANNEL COMPANY, 5, Windsor Buildings, George Street, LIVERPOOL.

RAMSGATE CORPORATION.
(GAS AND WATER DEPARTMENT.)

THE Gas and Water Committee invite TENDERS for the supply of about 110 tons of best BRIMSTONE ACID (what is known as 80 per cent. Acid, with a Specific Gravity of 142° Twaddel), to be delivered in equal monthly quantities between the 1st of September next and the 1st of September, 1894.
Tenders to be sent in, addressed to the Chairman of the Gas and Water Accounts Committee, on or before noon on Monday, Aug. 21, 1893, endorsed, "Tender for Sulphuric Acid."
The Committee do not bind themselves to accept the lowest or any tender.
Full particulars on application to
WILLIAM A. VALON,
Engineer.

COUNTY BOROUGH OF WIGAN.

TO TAR DISTILLERS AND OTHERS.

THE Gas Committee of the Wigan Corporation invite TENDERS for the surplus TAR produced at their Gas-Works, over a period of One, Two, or Three Years, commencing on the 1st of September, 1893.
Particulars and Form of Tender may be obtained on application to the undersigned.
The highest tender not necessarily accepted.
Tenders, sealed and endorsed "Tar," to be delivered to A. Smith, Esq., Town Clerk, on or before Aug. 14, next ensuing.
JOS. TIMMINS,
Engineer.
Borough Gas-Works, Wigan,
July 26, 1893.

HEYWOOD CORPORATION GAS-WORKS.

TENDERS are invited for Steam Tubes and FITTINGS.

Particulars from Mr. W. Whatmough, Gas Manager. Tenders, endorsed "Tubes and Fittings," to be sent to the undersigned not later than Tuesday, Aug. 15, 1893.

By order,
A. B. PILLING,
Town Clerk.

Municipal Buildings, Heywood,
July 27, 1893.

LEIGH LOCAL BOARD.

THE Gas Committee of the Leigh Local Board invite Tenders for the purchase of the surplus TAR produced at their Gas-Works for a period of One Year from the 1st of September next.

All Particulars, with Form of Tender, may be had from the undersigned.

Sealed tenders, endorsed "Tar," and addressed to J. Thorp, Esq., Chairman, to be delivered at the Town Hall, Leigh, on or before Monday, the 14th of August next.

The highest or any tender not necessarily accepted.

ALFRED T. FLETCHER,
Engineer and Manager.

Gas-Works, Leigh, Lancs.,
July 29, 1893.

STOCKTON-ON-TEES CORPORATION.

TENDERS FOR GAS COAL.

THE Gas Committee of the above Cor- poration invite TENDERS for the supply in whole or in part of 30,000 tons of GAS COAL for the year ending Aug. 31, 1894.

Particulars and Form of Tender can be obtained on application to the undersigned at the Gas-Works.

Tenders, sealed and endorsed "Tender for Gas Coal," to be sent in not later than noon of the 24th day of August, 1893, addressed to M. B. Dodd, Esq., Town Clerk, Stockton-on-Tees.

The Gas Committee do not bind themselves to accept the lowest or any tender.

WILLIAM FORD,
Manager.

Gas-Works, Stockton-on-Tees,
July 27, 1893.

MANCHESTER CORPORATION GAS-WORKS.

AMMONIACAL LIQUOR.

THE Gas Committee of the Corporation of Manchester are prepared to receive TENDERS for the PURCHASE and REMOVAL of the AMMONIACAL LIQUOR to be produced at the Gaythorn, Rochdale Road, and Bradford Road Gas-Works during a period of one or more years, commencing at Noon on the 30th day of June, 1894.

The Committee do not bind themselves to accept the highest or any tender.

Sealed tenders, addressed to the Chairman of the Gas Committee, and endorsed "Tender for Ammoniacal Liquor," must be delivered at the Offices of the Gas Department, Town Hall, on or before Monday, the 4th of September, 1893.

Forms of tender and further particulars may be obtained on application—in writing only—to Mr. Charles Nickson, Superintendent of the Department.

A deposit of one guinea (which will be returned on receipt of the tender) must accompany each application for a tender form.

By order of the Gas Committee,
WM. HENRY TALBOT,
Town Clerk.

Town Hall, Manchester,
July 21, 1893.

BROMLEY GAS CONSUMERS' COMPANY.

NOTICE is hereby given, that the ORDINARY HALF-YEARLY GENERAL MEETING of this Company will be held at the "Bell Hotel," Bromley, Kent, on Thursday, the 24th day of August inst., at Seven o'clock precisely, to receive the Report of the Directors, the Balance-Sheet confirmed by the Auditors, to declare Dividends, and for General Business.

The Transfer Books will be closed from the 12th to the 25th of August, 1893, both days inclusive.

By order of the Board,
HENRY W. AMOS,
Secretary.

Offices at the Works, Bromley,
Kent, Aug. 10, 1893.

Complete in Three Volumes. Price £4 4s., handsomely bound in Morocco, cloth sides, gilt edges.

KING'S TREATISE

ON THE

SCIENCE AND PRACTICE

OF THE

Manufacture and Distribution of Coal Gas

EDITED BY

THOMAS NEWBIGGING, C.E., M.Inst.C.E., and (the late) W. T. FEWTRELL, F.C.S.

[To enable those who purchased the first two volumes in parts to have the binding of the third Volume to match, sheets (price 22s.) can be had on application to the Publisher.]

LONDON:

WALTER KING, 11, Bolt Court, FLEET STREET, E.C.

The LIST will OPEN on WEDNESDAY, the 9th of August, and will CLOSE on SATURDAY, the 12th, for London, and MONDAY, the 14th, for the Country.

SALT LAKE AND OGDEN GAS AND ELECTRIC LIGHT CO.

ISSUE of $1,250,000 SIX PER CENT. 25-YEAR FIRST MORTGAGE GOLD BONDS,

Part of a total issue of $1,500,000.

Principal due the 1st of January, 1918, but subject to redemption at 10 per cent. premium on and after the 1st of January, 1896.

Interest payable half yearly on the 1st of January and the 1st of July.

The first payment (being a full half-year's Interest) will be made the 1st of January, 1894.

The Bonds will be redeemable under the operation of a Sinking Fund of 1½ per cent. per annum, commencing the 1st of January, 1896, to be applied to the purchase of the Bonds, at or under 110 per cent., and accrued Interest, or to Annual Drawings at 110 per cent. Drawn Bonds will be paid off at $1100 per Bond in New York, or at £226 17s. 6d. sterling in London; being the equivalent of $1100 at 4s. 1½d. to the dollar.

Principal and Interest will be payable free of United States taxes, in gold dollars, at the Office of the Farmers' Loan and Trust Company in New York, or at the Office of the Gas, Water, and General Investment Trust, Limited, in London, in sterling, at the fixed exchange of 4s. 1½d. to the dollar.

TRUSTEES FOR THE BONDHOLDERS.
THE FARMERS' LOAN AND TRUST COMPANY OF NEW YORK.

THE GAS, WATER, AND GENERAL INVESTMENT TRUST, LIMITED, 251, Winchester House, London, E.C., OFFER for SUBSCRIPTION the abovementioned $1,250,000 SIX PER CENT. FIRST MORTGAGE BONDS at the price of £205 per $1000 Bond, payable as follows:—

£20 on Application.
185 on Allotment.
£205

PROSPECTUS.

These Bonds are secured by a Registered First Mortgage over the properties of the Salt Lake and Ogden Gas and Electric Light Company, subject only to outstanding Bond issues, amounting in all to $110,000, which will be paid or provided for out of the present issue. This Company is incorporated under the laws of Utah, U.S.A., with a Capital of $1,500,000, of which $200,000 will remain unissued for the present, and has acquired by purchase the following undertakings:—

1. The Salt Lake City Gas Company, of Salt Lake City, U.S.A.
2. The Power, Light, and Heating Company, of Salt Lake City, U.S.A.
3. The Ogden Gas Light and Fuel Company, of Ogden, U.S.A.

The Company holds privileges and franchises, having about 25 years to run, for Gas and Electric Lighting in each City.

Previous to the consolidation of the Companies, the Gas, Water, and General Investment Trust, Limited, instructed Messrs. Stevenson and Burstal, Gas and Water Engineers, to report upon the Works of the respective Companies. Extracts from their reports are enclosed in the Prospectus.

In view of the rapid growth of the two Cities, and of the consequent increase of the demand for Gas and Electric Light, it has been found necessary to make special provision for further extensions and improvements.

For this purpose there will be available at least $130,000 of the present issue, and the further sum of $250,000 Bonds unissued, besides real estate not required for the purposes of the Company, estimated to be worth $60,000.

The Accounts of the three Companies to the 31st of December, 1892, have been examined by Messrs. Kemp, Ford, and Co., whose report, enclosed in the Prospectus, shows that the total amount at debit of construction account of the three Companies at that date was $1,034,374, and that the net earnings for the Year 1892 (those of the Salt Lake Power and Heating Company being taken for the Twelve Months ending the 30th of September, 1892) amounted to $131,185. The amount required to pay the Interest and Sinking Fund on the present issue of Bonds is $93,750.

There had been expended on the three properties up to the 31st of December, 1892, the sum of.	$1,034,374·35
There has been expended since in extensions.	135,000·00
The Company owns unused land valued at	60,000 00
Of the present issue of Bonds there are reserved for future extensions	130,000·00
Making a total of	$1,359,374·35

It will thus be seen that the cash expended on the properties and the value of the land and cash reserved for future extensions exceed the amount of the present issue of Bonds by $109,374·35, without taking into account the value of the franchises owned by the Company or any sum for goodwill.

It is intended that Messrs. Kemp, Ford, and Co. shall annually visit Salt Lake City for the purpose of auditing the accounts of the combined Undertakings on the spot.

The following particulars as to Salt Lake City are extracted from "An Illustrated Guide to Salt Lake City and its Environs, 1892":—

SALT LAKE.

"Salt Lake City, the capital of Utah, occupies an important central position in the territory, and is the metropolis of the inter-mountain region.

"The City has an area of 10,000 acres, and a population of 60,000 inhabitants. It is laid out principally in blocks or squares of 10 acres each. Each street is 132 feet wide, including the side-walks, which are 16½ feet in width.

"No city in the country is better lighted than Salt Lake City; at each street crossing in the business and residential portions is a 2000-candle power arc lamp, 20 feet above the street. Business houses and residences are lighted by arc and incandescent electric lights or gas.

"Salt Lake City contains 10,000 buildings, 200 factories, sixteen newspapers, sixteen banking houses, twenty-eight printing-houses, and thirty public schools. It is the centre of a mining region that has produced precious metals to the value of $125,000,000, and which is now turning them out at the rate of $10,000,000 per annum."

The following information respecting Ogden is published by the Colorado Midland Railway Company, in a book entitled "The Heart of the Rockies," published in 1890:—

OGDEN.

"Ogden is one of the oldest settlements in Utah, and has now attained the dignity of a City with 20,000 inhabitants. It is the key of the Railroad situation in the inter-mountain region.

"In the way of public improvements Ogden has done remarkably well for a City of its size. Something like twenty miles of asphalte side-walks have been laid; the best systems of electric lights are in operation; two systems of electric railways are about completed, and are partly in operation; they together constitute about 20 miles of tracks. The streets are being macadamized and improved; a sewerage system is under construction; the fire department is one of the finest in the Territory; Ogden is the seat of the Utah Wesleyan University."

After discharging the obligations incurred in connection with the purchase of the properties and the expenditure for the improvements already made, the proceeds of these Bonds will be applied to further extensions and improvements as and when required, and to provide for the outstanding issues of Bonds amounting to $110,000 above referred to. Copies of the Purchase Contract made between James Elliot Condict and the Gas, Water, and General Investment Trust, Limited, as Trustee for the American Company, dated the 23rd of December, 1892, and a supplemental Contract between the same parties, dated the 13th of April, 1893, can be inspected at the Office of the Gas, Water, and General Investment Trust, Limited, Winchester House, E.C.

Mr. Hilton, one of the Directors of the Gas, Water, and General Investment Trust, Limited, and Mr. Kelman, the Secretary, have just returned from Salt Lake. After a careful inspection, they report as follows: "We are of opinion that no better security can be offered to an investor than the present issue of Bonds."

A quotation for the Bonds will be applied for on both the London and New York Stock Exchanges.

Applications for the Bonds must be made on the form accompanying the prospectus. If no allotment is made, the deposit will be returned in full; and if only a portion of the amount applied for is allotted, the balance of the deposit will be applied towards payment of the amount due on allotment. Default in payment of the allotment money will render the amounts previously paid liable to forfeiture.

Prospectuses and Forms of Application may be obtained at the Offices of the Gas, Water, and General Investment Trust, Limited, Winchester House, E.C.; or from the National Provincial Bank of England, Limited, 112, Bishopsgate Street Within, London, E.C., and branches; Lloyds Bank, Limited, 72, Lombard Street, London, E.C., and branches; or from Messrs. Foster and Braithwaite, 27, Austin Friars, E.C.

With a view to securing continued efficient management of the properties, an English Company has been formed in which the control of the American Company will be vested, and of which the Directors are as follows:—

CHARLES BARCLAY, Esq.
JOHN BOUSTEAD, Esq.
JOSEPH BEVAN BRAITHWAITE, Esq.
Lord CLAUD HAMILTON.
C. SHIRREFF HILTON, Esq.
The Hon. HENRY NOEL.
THOMAS SALT, Esq.
} Directors of the Gas, Water, and General Investment Trust, Ltd.

London, Aug. 4, 1893.

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Practical Photometry.

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Now Ready, Price 6s., Cloth Bound.

THE CHEMISTRY OF ILLUMINATING GAS,

By

NORTON H. HUMPHRYS, Assoc. M.Inst.C.E., F.C.S.

This work contains chapters on: The Relative Cost of Light from Gas, Oil, and Candles; Products of Combustion; The Sulphur Question; The Composition of Illuminating Gas; Water Gas; Various Gas-Making Processes; Oil Gas; Properties of Fluid Hydrocarbons; Tar for Gas Making; Destructive Distillation; Condensation; and Purification.

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CONSPIRACY and Protection of Property Act. It is required, under a Penalty of FIVE POUNDS, that a Printed Copy of the 4th Section of this Act shall be posted up at all Gas-Works, in a conspicuous place, where the same may be conveniently read by the persons employed thereat.

Printed copies of this Section, in large type, on broad sheets, may be obtained of WALTER KING, 11 Bolt Court, FLEET STREET, E.C.

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In Paper Cover, Price 1s.

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WITH OR WITHOUT
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A DISCUSSION
BETWEEN
E. LLOYD PEASE & F. SOUTHWELL CRIPPS.

To which is added a Synopsis of all the Literature (English and Foreign) on Reducing or Abolishing the Guide-Framing of Gasholders, also the principal Literature on Gasholder Construction generally, compiled to March, 1893; with a List of all the English and Foreign Periodicals connected with the Gas Industry.

By F. SOUTHWELL CRIPPS.

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HEBBURN MAIN GAS COALS.

Yield of Gas per ton . . . . . 10,500 cubic feet.
Illuminating Power . . . . . 16·4 candles.
Coke . . . . . 68 per cent.

For prices, f.o.b. Ship or Delivered by Rail, apply to
THE WALLSEND & HEBBURN COAL COMPANY, LTD.,
B Lombard Street,
NEWCASTLE-ON-TYNE.
W. RICHARDSON, Fitter.

MEIKLEJOHN'S PATENT
Improved Slide-Valve Anti-Dip.

Is perfectly reliable in action, and requires no attention. Has all the advantages of the Dip and Anti-Dip combined.
Is cheap and easily fixed to any form of main.
Will be found the most efficient appliance of the kind yet introduced.
Further particulars and price from

C. MEIKLEJOHN,
GAS-WORKS, RUGBY.
(Late N. MEIKLEJOHN, Longwood.)

THE SILICA FIRE-BRICK COMPANY,
OUGHTIBRIDGE, near SHEFFIELD,
MANUFACTURE
SILICA BLOCKS, BRICKS, AND CEMENT
OF SUPERIOR QUALITY
FOR GAS-FURNACES.

Trade Mark: "SILICA."

These Goods (largely used in Gas, Glass, Iron, and Steel Works) are, on account of their
GREATER DURABILITY
Strongly recommended where EXCESSIVE HEATS have to be maintained.

ROBERT MARSHALL,
CANNEL COAL MERCHANT,
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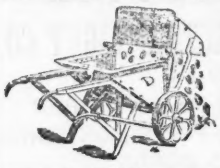
Prices and Analysis of all the Scotch Cannels on application.

PRICE'S PATENT COKE & COAL BARROW



effecting a great saving of time labour, and expense.
For particulars, price, &c., apply to Mr. E. PRICE, Inventor and Patentee, 22, Alwyne Road, Canonbury, LONDON, N.

Prices are Reduced.

NEWBATTLE CANNEL.
Highest Results in Gas, & Excellent Coke.

QUOTATIONS ON APPLICATION TO
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LIMITED,
NEWBATTLE COLLIERIES,
DALKEITH, N.B.

JAMES OAKES & Co.,
ALFRETON IRON-WORKS, DERBYSHIRE,
AND
Wenlock Iron Wharf, 21 & 22, Wharf Road,
CITY ROAD, LONDON, N.

Manufacture and keep in Stock at their Works
(also large stock in London)

PIPES and CONNECTIONS, 1¼ to 48 inches in diameter, and make and erect to order RETORTS, PURIFIERS and TANKS, with or without planed joints, COLUMNS, GIRDERS, SPECIAL CASTINGS, &c., required by Gas Water, Railway, Telegraph Chemical, Colliery, and other Companies.
NOTE. — Makers of HORSLEY'S PATENT SYPHONS. These are cast in one piece, without Chaplets; doing away with bolts, nuts, and covers and rendering leakage impossible.

CAST-IRON PIPES
FOR GAS AND WATER.

Pipes, One to Six inch Bore, kept in Stock. Also a very large assortment of all sizes of Bends, T-pieces, and Specials ready for despatch on receipt of Order.

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CONTRACTS FOR SUPPLIES OF ANY OF THE PRINCIPAL
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Samples and Prices on application.
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Established 1872.

LONDONDERRY GAS COALS
FROM THE
MARQUIS OF LONDONDERRY'S COLLIERIES,
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Available output up to 5000 tons per day.
Yield of Gas 11,000 cubic feet per ton of Coal as per analysis by
Mr. John Pattinson, F.C.S., F.I.S.

FOR PRICES AND PARTICULARS, APPLY TO
S. J. DITCHFIELD,
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FOR GAS FURNACES our GANNISTER and SILICA FIRE-BRICKS are acknowledged to be the best and most durable in the Market.

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FURNACE CEMENT specially made for repairing Furnaces and stopping Cracks.

ANALYSIS AND REFERENCES ON APPLICATION.

BOLDON GAS COALS.
Worked by THE HARTON COAL CO., LTD.,
Output about 3000 tons per day.

ANALYSIS—

Yield of Gas per ton . .	10,500	Cubic Feet.
Illuminating Power . .	16·9	Candles.
Coke	66·7	Coke.
Sulphur	0·86	Sulphur.
Ash	2·04	Ash.

Boldon Gas Coals are supplied under contract to
The Gaslight and Coke Company, South Metropolitan Gas Company, Commercial Gas Company, Imperial Continental Gas Association, European Gas Company, L'Union des Gaz (the Continental Union Gas Company), Ipswich Gaslight Company, Devonport Gas Company Newcastle Gas Company, Sunderland Gas Company, South Shields Gas Company, and to many other Companies at Home and Abroad.

For prices, &c., apply to the
HARTON COAL COMPANY,
LIMITED,
Newcastle-on-Tyne.
W. H. PARKINSON,
FITTER.

TROTTER, HAINES, & CORBETT,

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FIRE-CLAY & BRICK WORKS,

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Manufacturers of GAS-RETORTS, GLASSHOUSE FURNACE & BLAST-FURNACE BRICKS, LUMPS TILES, and every description of FIRE-BRICKS.

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SHIPMENTS PROMPTLY AND CAREFULLY EXECUTED.

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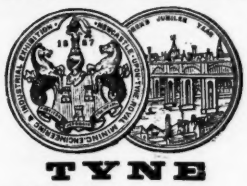

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Yield of Gas per ton	13,155 cub. ft.
Illuminating Power	38·22 candles.
Coke per ton	1,301·88 lbs.

EAST PONTOP GAS COAL.

Yield of Gas per ton	10,500 cub. ft.
Illuminating Power	16·3 candles.
Coke	70 per cent.

SOUTH PELAW MAIN GAS COAL.

Yield of Gas per ton	10,500 cub. ft.
Illuminating Power	16·8 candles.
Coke	73·1 per cent.

For Prices and complete Analysis, apply to

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COAL OWNERS, NEWCASTLE-ON-TYNE;

OR

E. FOSTER & CO.,

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HOLMSIDE GAS COALS.

(Wrought out of Holmside and South Moor Collieries.)

PRESENT production 4000 tons per working day. Area of coal about 5000 acres, including the largest remaining workable proportion of pure HUTTON SEAM GAS COAL. Analysis of HOLMSIDE GAS COAL *in bulk as shipped* gives 10,500 cubic feet of Gas per ton, of an Illuminating Power of 16¼ candles. The Sulphur is about 1 per cent., and the Ash 1¾ per cent. The Coal cokes well, and leaves about 70 per cent. of excellent Coke. To show the progress of HOLMSIDE COALS, it may be mentioned that the quantity carbonized by the London Gas Companies in 1885 was about 200,000 tons; whereas the present consumption of HOLMSIDE COALS in London alone is at the rate of nearly

600,000 Tons per Annum.

Full particulars on application to

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The Analysis made by Messrs. J. and H. T. Pattinson, Public Analysts for Northumberland, gives 10,500 cubic feet of Gas per ton, with an Illuminating Power of 16·3 Candles and 67·3 per cent. of Coke. The following is a Working Analysis made of these Coals by the Tudhoe and Sunderland Bridge Gas Company:—

[COPY.]

TUDHOE AND SUNDERLAND BRIDGE GAS COMPANY.

Tudhoe Gas-Works,
Spennymoor,
8th June, 1893.

Messrs. The

WEARDALE IRON & COAL COMPANY, LTD.

GENTLEMEN,

For the last two months we have used your **THORNLEY GAS COAL** exclusively at these gas-works; and I have pleasure in herewith giving you the actual results obtained during the trial.

Yield of Gas per ton: 10,300 cubic feet.

Yield of Coke: 13½ cwt.

Illuminating Power of Gas, average of a series of tests, **17 Sperm Candles.**

The Coke was of excellent quality.

The following is a complete ultimate Analysis of the Coal.

	Per Cent.
Carbon	83·128
Hydrogen	5·116
Oxygen	7·401
Nitrogen	0·585
Sulphur	0·620
Ash	3·130
Water	0·020
	100·000

Analysis of the Coke.

Carbon	93·31
Sulphur	0·61
Ash	5·00
Moisture	1·08
	100·00

I am, Gentlemen,
Yours truly,
A. B. COWAN,
Manager.

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To pass 300,000 Cubic Feet per Hour, with or without Engine combined.

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AND EQUAL TO

5,340,000 CUBIC FEET PER HOUR.

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The Four-Blade Exhauster **PASSES 50 PER CENT. MORE PER REVOLUTION** than any One or Two Blade Exhauster.

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One of our 150,000 feet per hour Patent Four-Blade Exhausters passes continuously **180,000** cubic feet per hour, driven by a **12-INCH STEAM CYLINDER.** No other Maker can give a similar result.

Model of Patent Exhauster sent for inspection.

Oldest Makers of Beale Exhausters for over 300 Works.

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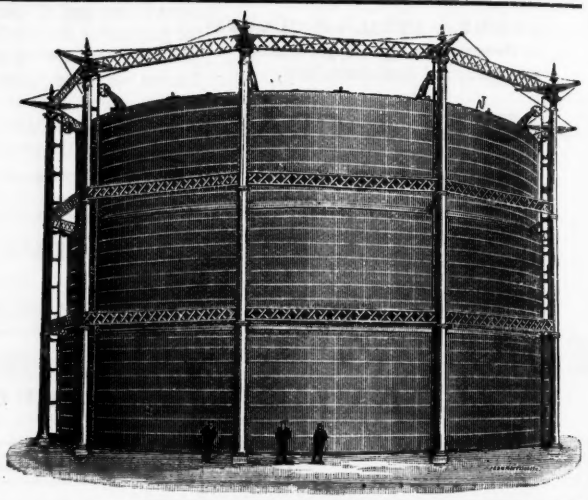
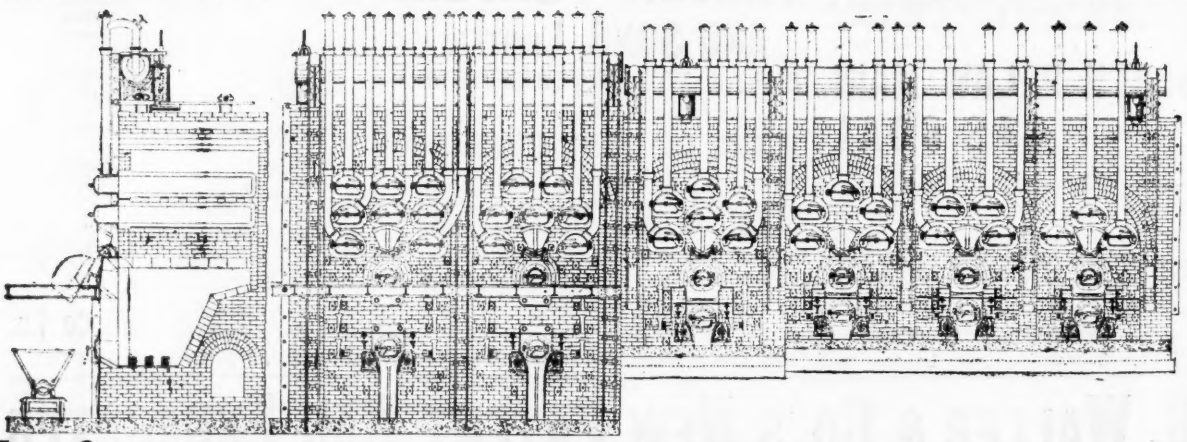


HISLOP'S PATENT REGENERATIVE SETTINGS OF GAS-RETORTS.



THESE SETTINGS ARE ADAPTED TO THE REQUIREMENTS OF ALL GAS COMPANIES AND GAS CORPORATIONS, AND HAVE ALREADY BEEN EXTENSIVELY ADOPTED. THEY ARE ERECTED UPON BOTH THE WORKING-STAGE AND SHALLOW-CHAMBER SYSTEMS AND EQUALLY SATISFACTORY RESULTS ARE GUARANTEED IN BOTH CASES.

THE SETTINGS HAVE ATTAINED TO A MEASURE OF SUCCESS AND POPULARITY QUITE UNEQUALLED BY THAT OF ANY OTHER WITHIN THE SAME SPACE OF TIME. THE WORKING RESULTS OBTAINED, AND THE GENERAL SATISFACTION GIVEN, ARE DECLARED IN EVERY CASE TO EXCEED, AND IN MOST CASES CONSIDERABLY EXCEED, THE PATENTEE'S GUARANTEE. THE CONSTRUCTION AND WORKING OF THE PATENT PRODUCER AND THE PATENT CHARGING APPARATUS FOR SAME ARE ABSOLUTELY UNIQUE AND UNRIVALLED, AND ARE THE DELIGHT OF EVERY STOKER; WHILE IN EVERY OTHER PARTICULAR THEY SECURE THE HIGHEST RESULTS ATTAINABLE BY ANY REGENERATIVE SYSTEM, AND AT A MINIMUM OF COST.

Drawings and Specifications are furnished for the complete erection of Ovens, with or without Retort and Bench Mountings or complete erection undertaken if required, and carried out by specially Trained Workmen.

Further particulars may be obtained on application to the Patentee's Agents: C. M. HAMILTON, 5, Stewart Street, Shawlands, Glasgow; J. E. FISHER, Stourbridge, and from R. F. HISLOP (son of Patentee), Gas-Works, Paisley.

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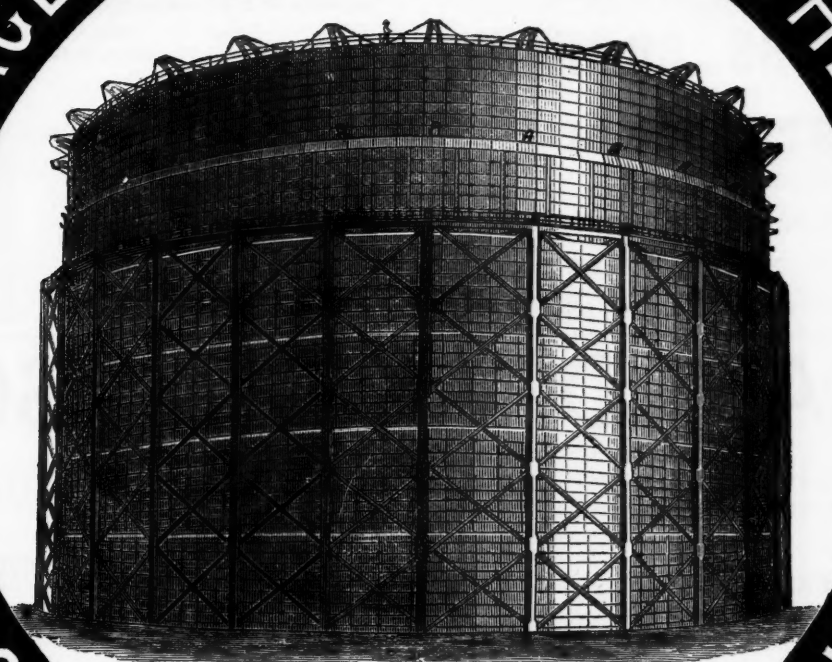

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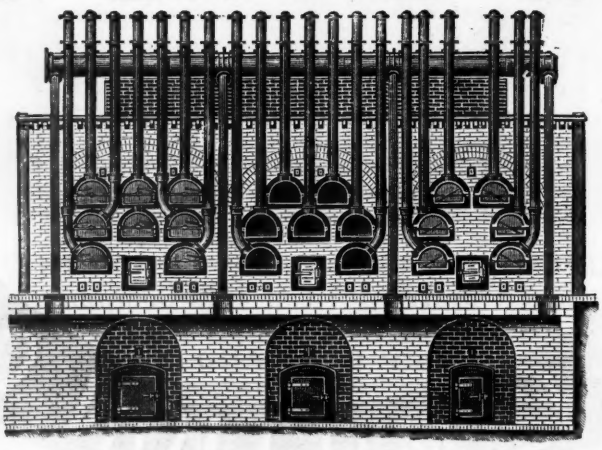

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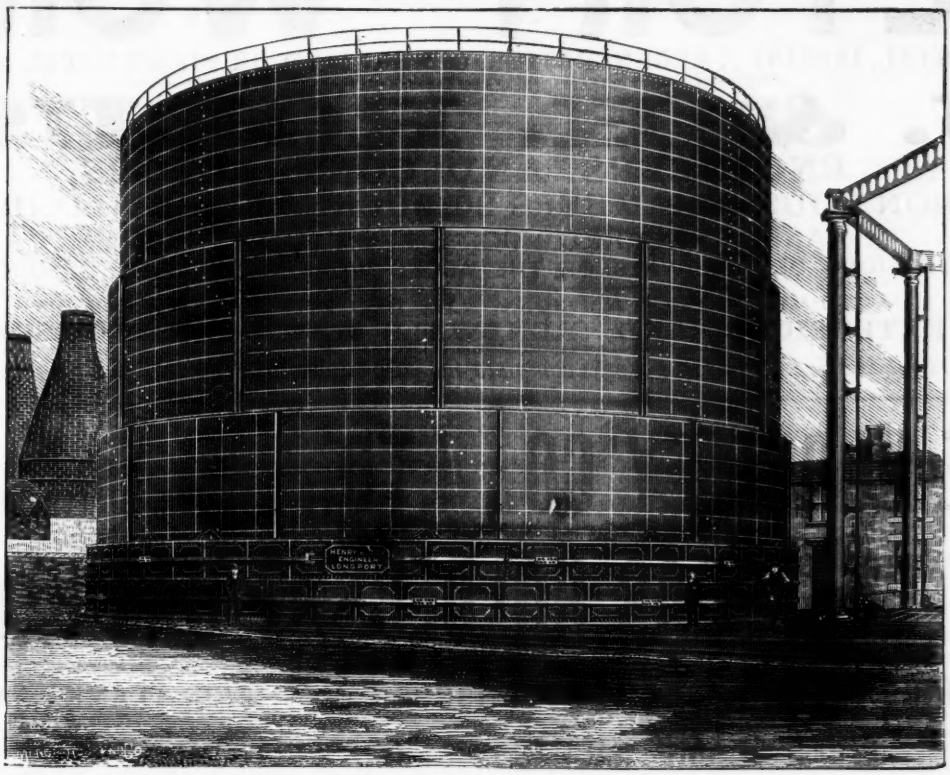

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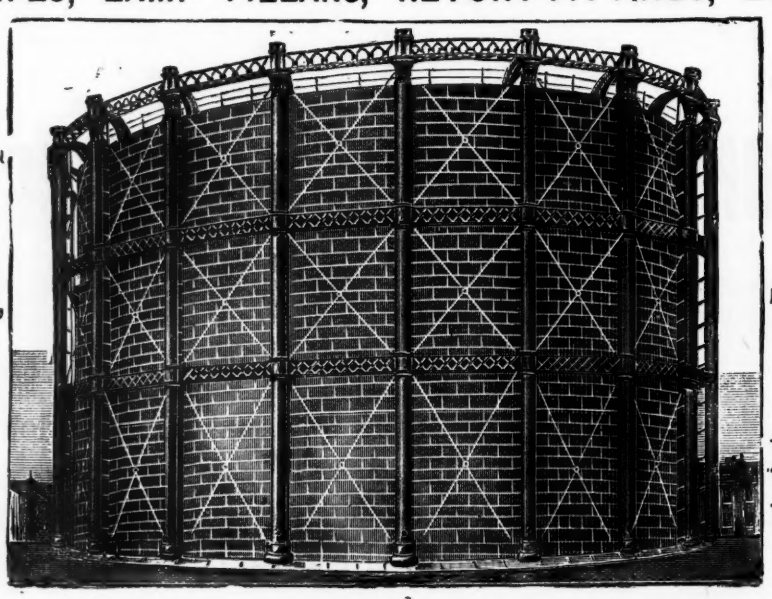

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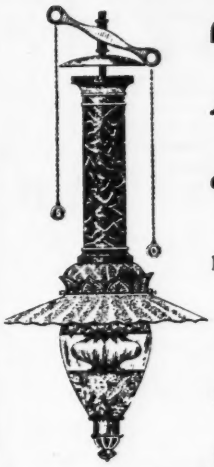

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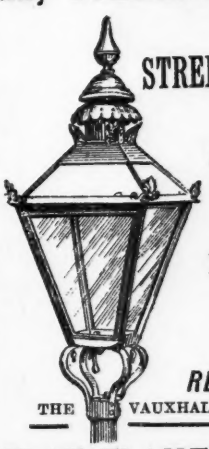

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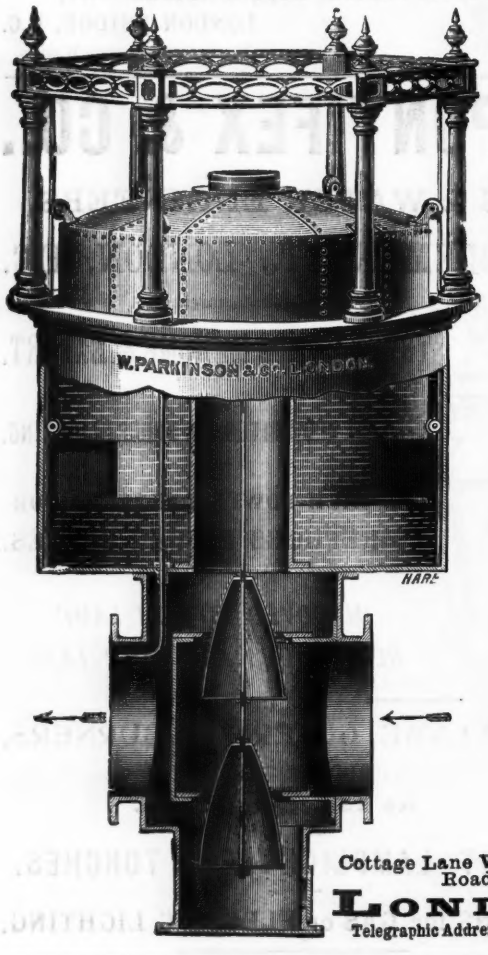

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See also Advt., p. 254.

London: Printed by WALTER KING (at the Office of King, Sell, and Railton, Ltd., 12, Gough Square); and published by him at 11, Bolt Court, Fleet Street, in the City of London,—Tuesday, Aug. 8, 1893.